

RAILROAD GAZETTE

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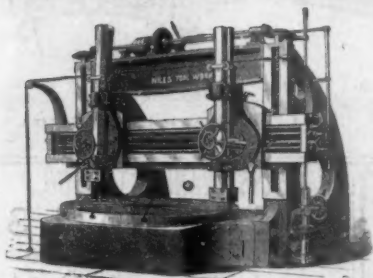
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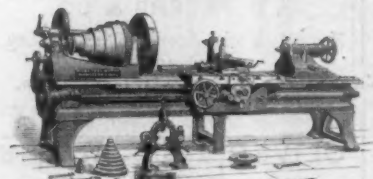
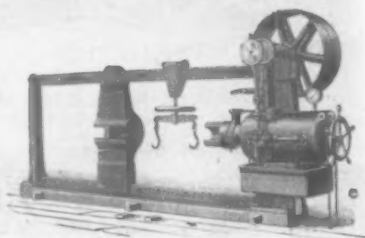
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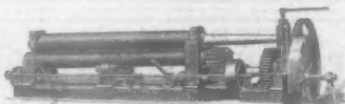


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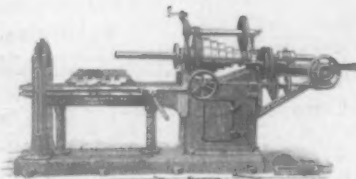
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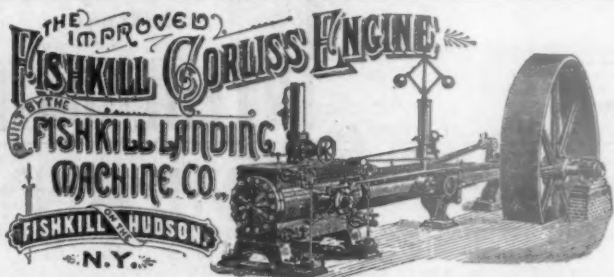
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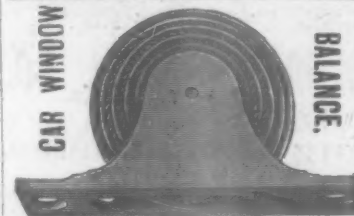
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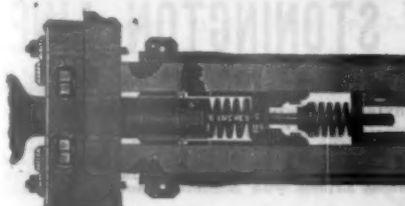
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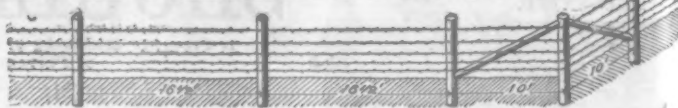
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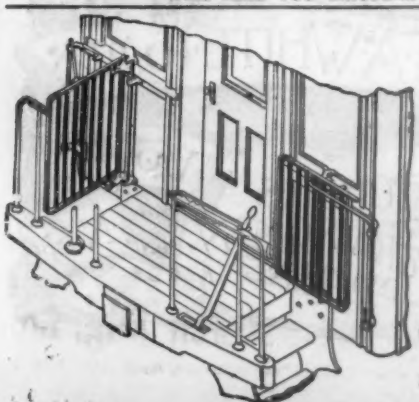
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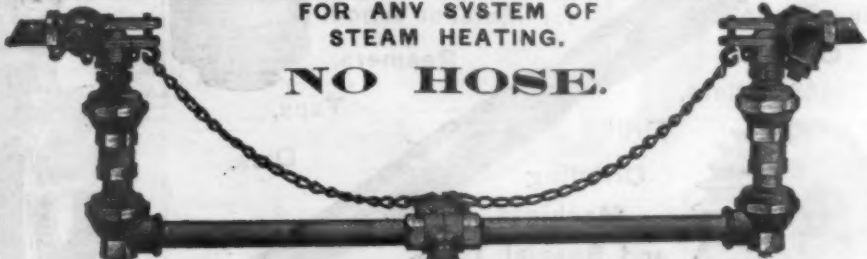
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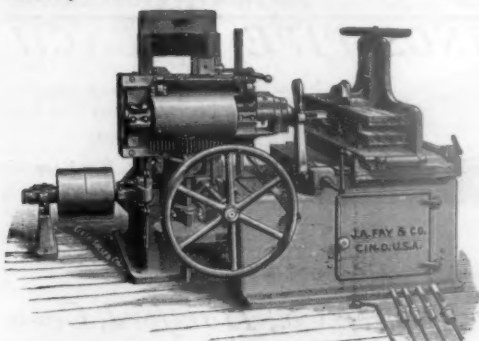
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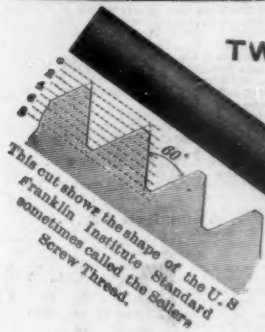
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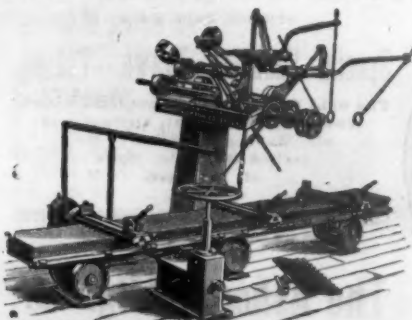
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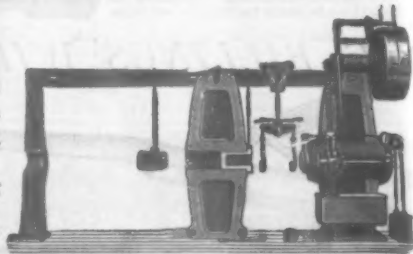
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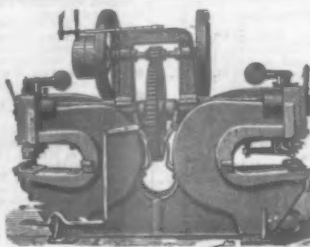
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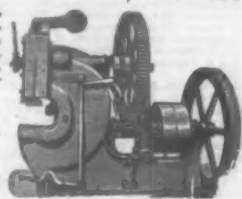
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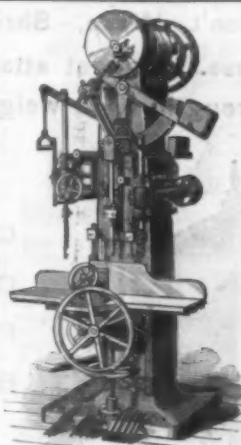
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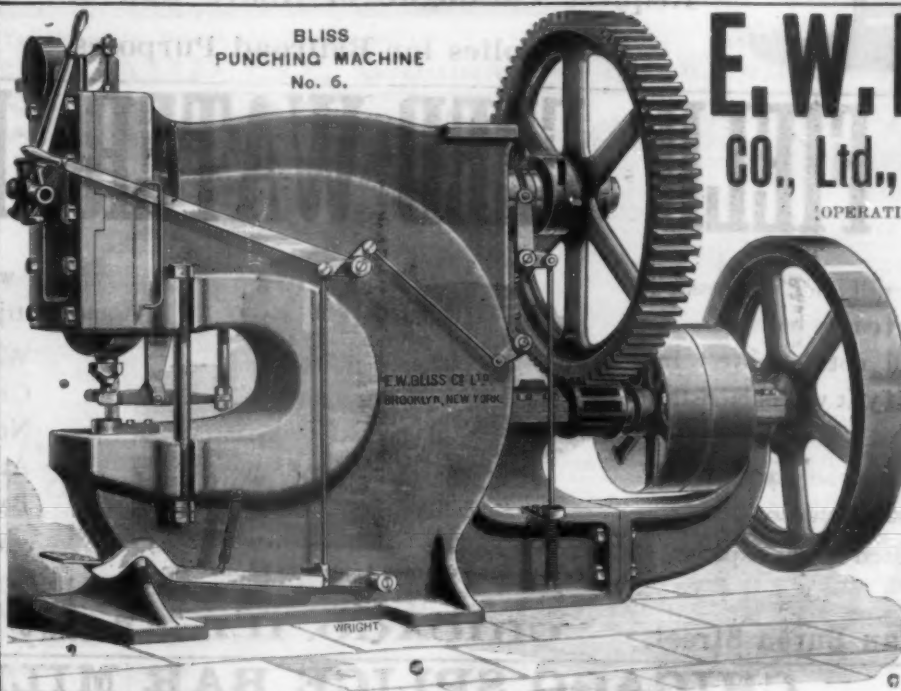
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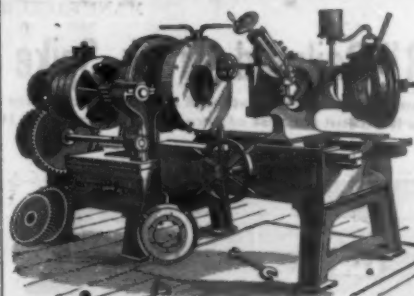
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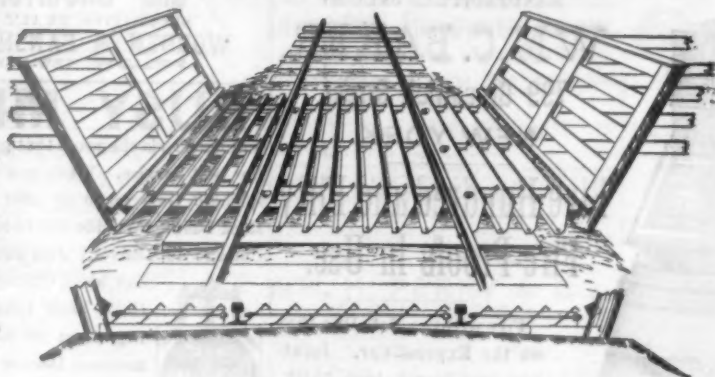


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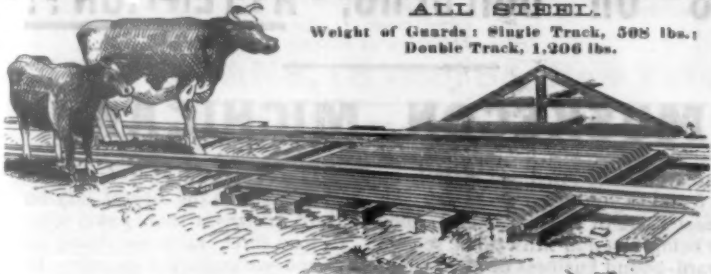
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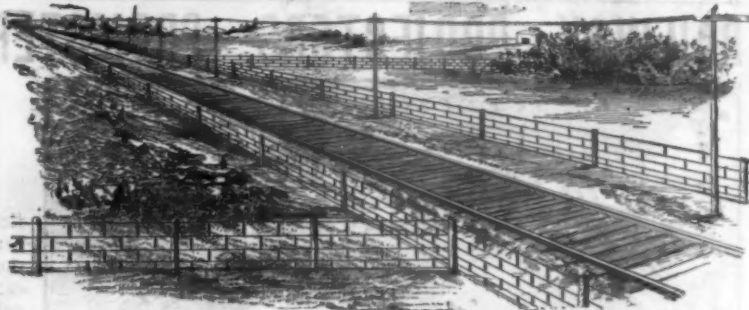
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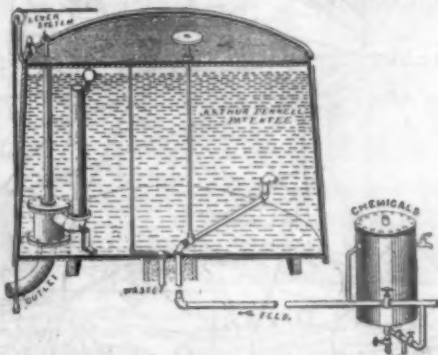


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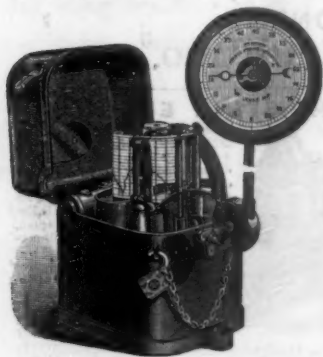
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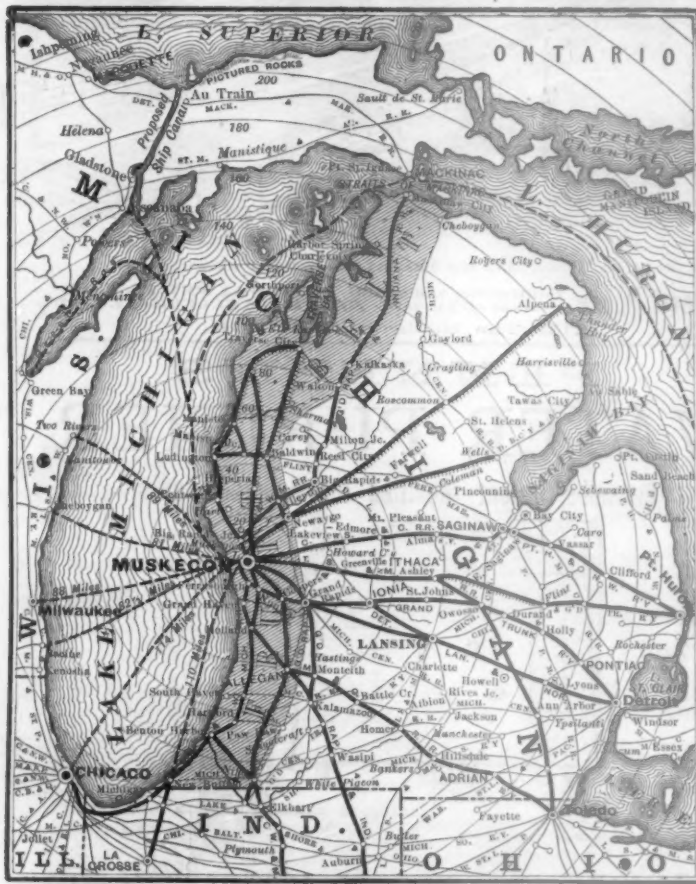
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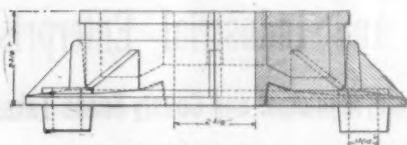
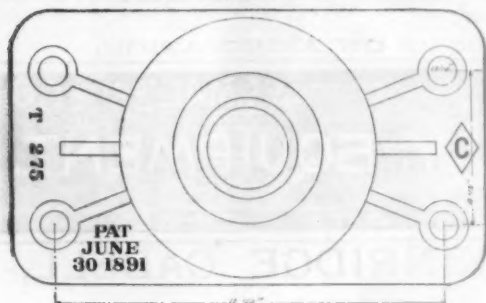
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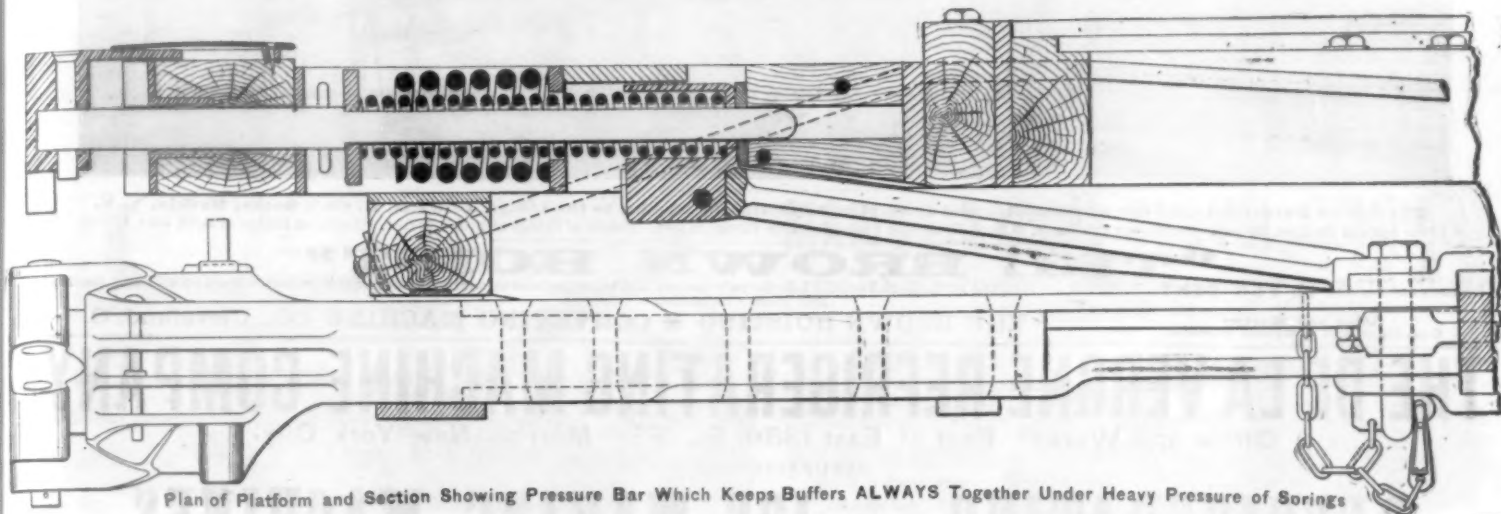
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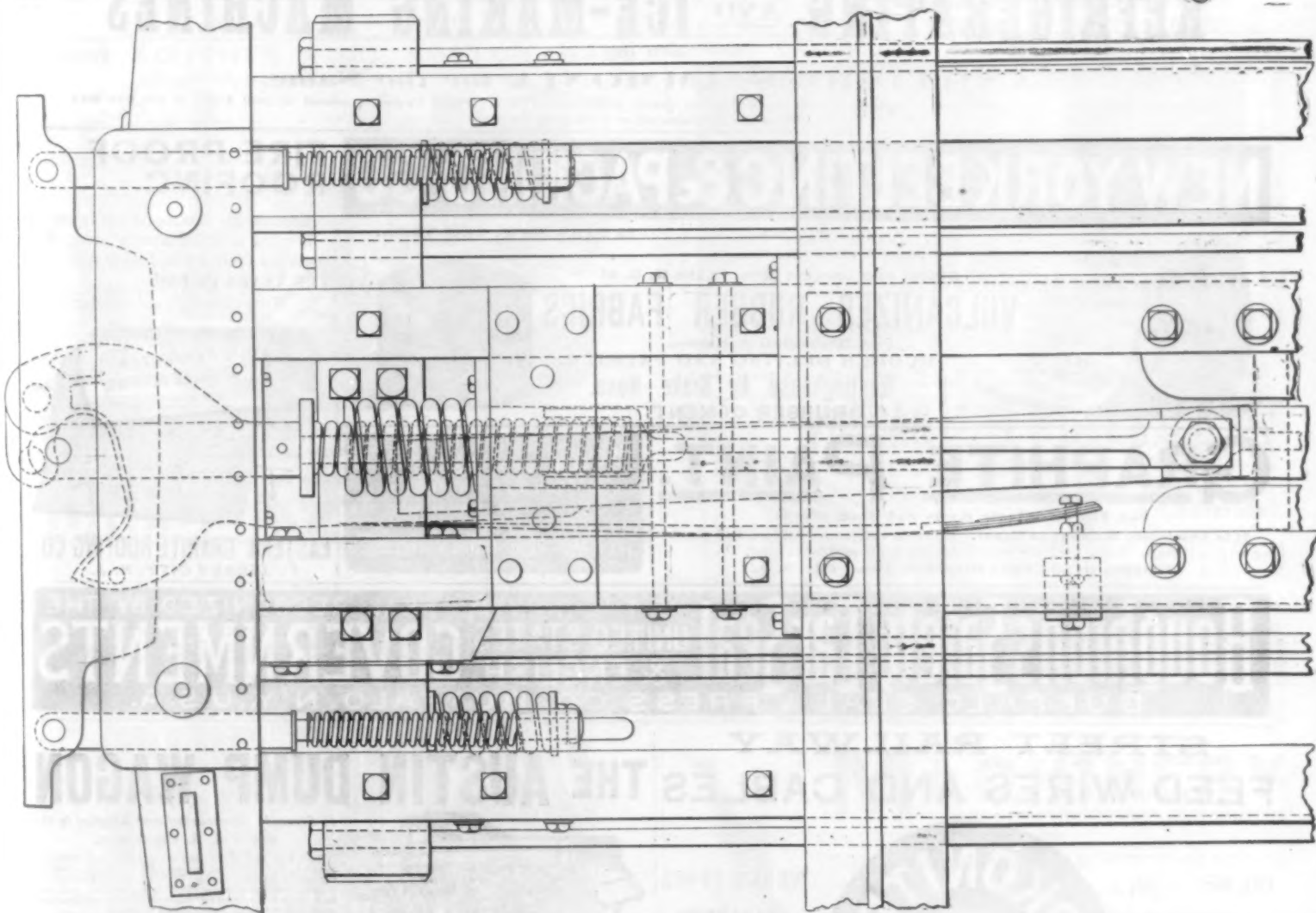
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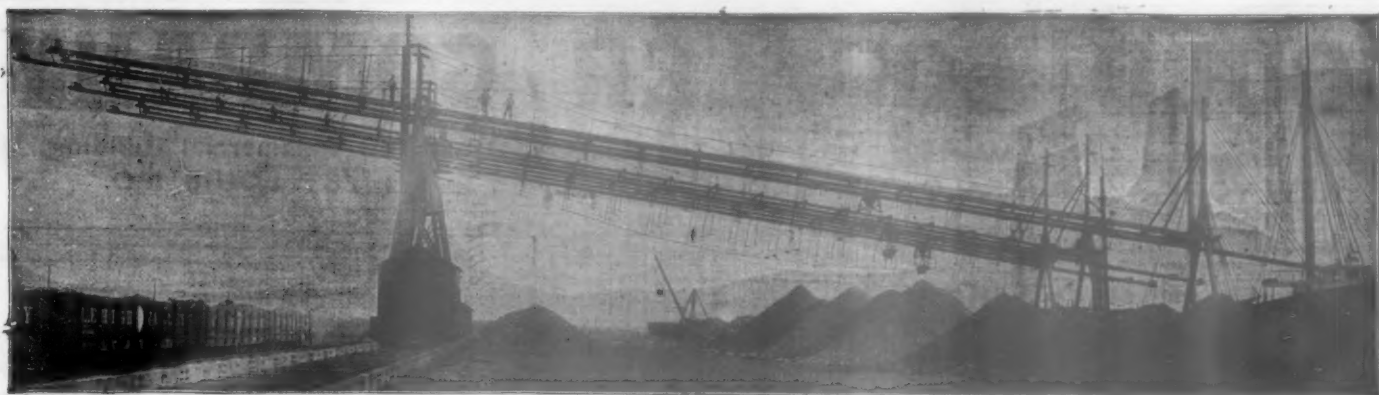
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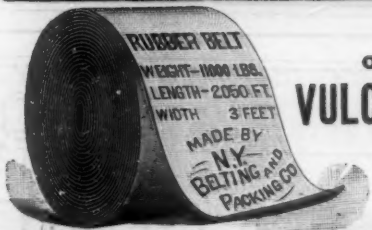
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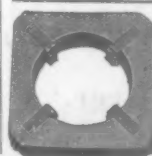
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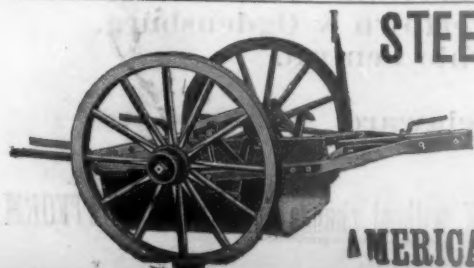
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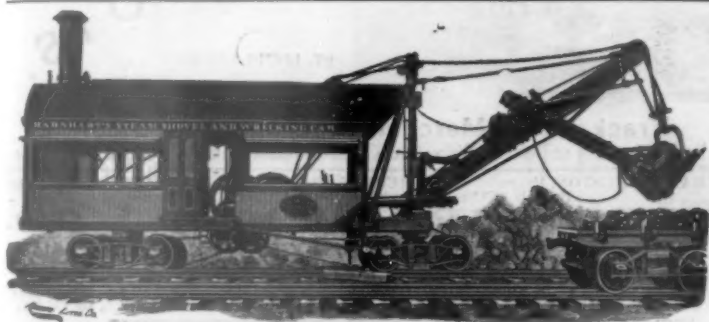
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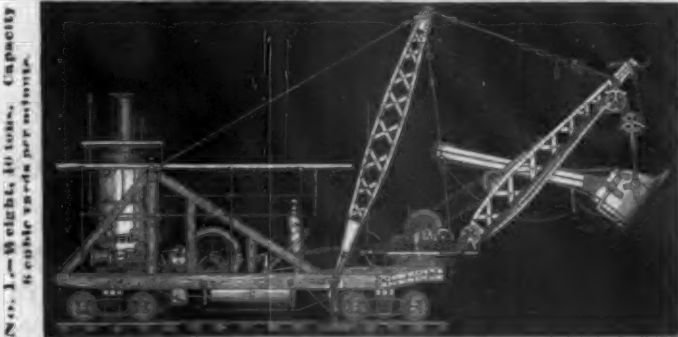
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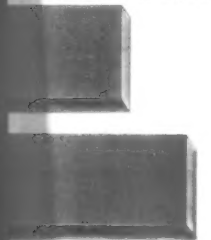
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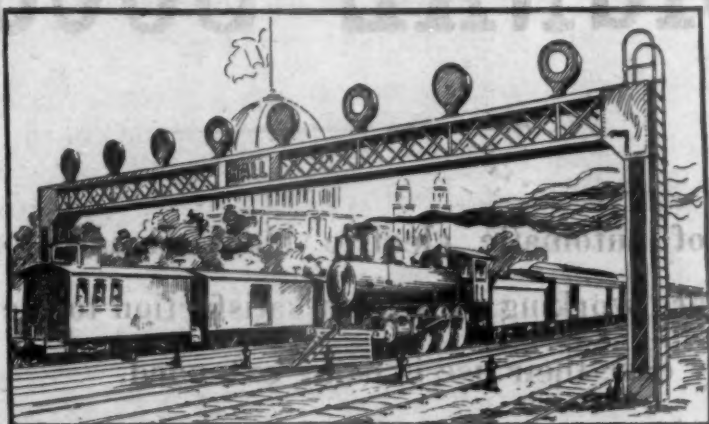
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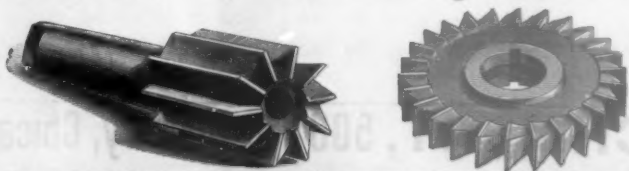
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Contributions.

Rate Cutting and Railroad Agreements.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It seems to me that the silly controversy as to who is to blame for the reduction in fares to Denver affords one of the most instructive lessons of recent years, concerning prevailing methods of rate-makers, and I would like to ask if this is not a very appropriate occasion to find out when this foolishness is going to stop.

Look, for a moment, at the facts:

Last April the Atchison found that some of its competitors were getting the better of it by concessions of various kinds which produced a reduction from the agreed rate of \$28.15 to \$12. The Commissioners of the Western Traffic Association refused to authorize an open rate of \$12 until the matter should have been acted upon in the auxiliary associations and a question of difference presented. Thereupon, the Atchison applied to Commissioner Finley, but he declined to give an opinion as Chairman of the Western Passenger Association, as his jurisdiction included a road not a member of the Western Traffic. Then the Atchison gave 90 days' notice of intention to publish the rate, addressing it to the Advisory Board, the Commissioners protesting that they deemed this notice illegal. The Advisory Board in July neglected to act upon any of the subjects named in the call. In the meantime Mr. Finley was succeeded by Mr. Caldwell, and the Atchison applied to him for permission to make the rate, claiming to have proof of reduced rates being quoted by outside lines. The chairman did not find this evidence conclusive, and

peal from the decision. The article in question reads: "It shall be the duty of the chairman to make this appointment whenever called upon by an aggrieved party to do so, within five days." Arbitrators upon this question have now been agreed upon, who will decide whether the board shall consist of Messrs. Smith and Ford, or only Mr. Ford. Then another set of arbitrators will decide whether Mr. Ford is eligible and then, if there are any gentlemen left who are qualified to act, the original appeal will be submitted to arbitration.

Now, while all these weighty matters are being decided, the business has been carried at the cut rate; all the lines have sacrificed one-half of the legitimate revenue which they had reason to expect from the excursion, and have probably seriously cut into their regular Colorado summer tourist business; and they have crowded the rate down below the paying limit. They have filled Denver with twice as many people as the city had planned to take care of, and in consequence made the affair almost a nuisance to the originators, the Knights; they have engendered a strife which may result in the breaking up of the association—and all for what?

Such exhibitions as these only serve to strengthen my view that the only way the stockholders can be protected is by the absolute divorcing of the rate making power from the traffic departments and the placing of it where it belongs, in the hands of the directors and presidents.

M. W. C.

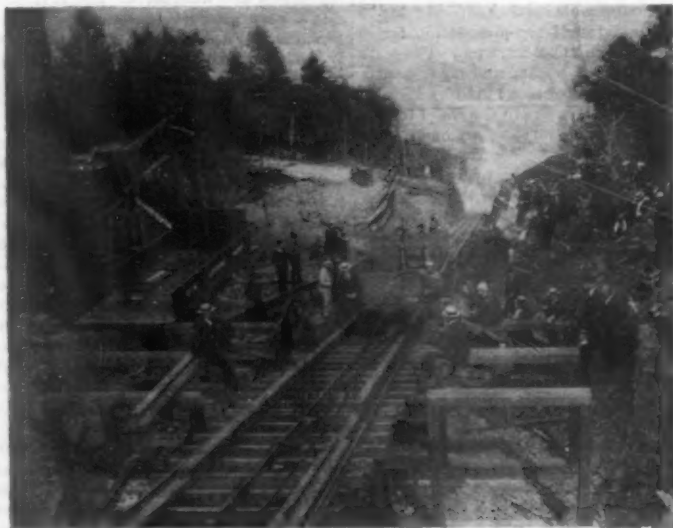
The Otis Cable Elevating Railroad.

To those familiar with the coal inclines in the mining regions of Pennsylvania, the general character of the Otis cable elevating railroad in the Catskill Mountains, which was opened for regular passenger traffic on August 4, requires no special explanation. The underlying principle is essentially the same in both cases. The Otis railroad, however, is built throughout on a larger scale,

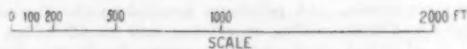
age grade of about 12 per cent. The gauge of the track is 3 ft.

Otis station, where the traveler changes from the cars of the Catskill Mountain Railroad to the car of the Otis Elevating Railroad, is a little more than a mile south of Mountain House Station and a little less than a mile north of Palenville. The Otis railroad accommodation really consists of two cars at each end, one for passengers and the other for their baggage. Looking up from Otis station one sees the mountains directly in front, a mile or so away, and perched high up on one of them the Mountain House is plainly in view. In riding up the mountain on the road the passenger is seated with his back to the mountains, facing the valley, and moving with a speed of about 700 ft. a minute. The down cars are passed midway, and the ascent is completed in about 10 minutes. The upper station is about 300 ft. north of the Mountain House.

Hoisting Machinery.—The hoisting machinery at the mountain top is made up, to begin with, of two 12 x 30 in. Hamilton-Corliss engines, made by Hoovens, Owen & Rentschler, of Hamilton, O. They are fitted up with link motion, and are probably the only reversing Corliss engines in this, or, for that matter, any other country. As worked on the road, they are controlled not only by the regular automatic cut-off gear, but also by the throttle valve, the reverse lever, and the brakes on the engines, making altogether a most unusual combination. The engines, in regular working, are rated at about 75 H. P. each and are geared in the ratio of 22 to 100 to one of two Walker differential drums, each 12 feet in diameter, and placed tandem-fashion. The Roebling wire hoisting cables, of which there are two for each car, are 1½ in. in diameter and are wrapped twice around each drum. Each cable is 7,250 ft. long, and weighs about 10 tons. Ground idlers, placed 30 ft. apart along the line, support the cables in going up and down the mountain. At the turnout the idlers, for ob-



The Otis Elevating Railroad.



PROFILE OF THE OTIS ELEVATING RAILROAD.

declined to grant the request. The road then made the \$12 rate. Chairman Caldwell thereupon ruled that it was guilty of a violation of the agreement. From this ruling the Atchison appealed, and named as arbitrator Mr. E. A. Ford, of the Vandalia. Chairman Caldwell objected to him on the ground that he was an interested party, the Vandalia being a part of a through line from Chicago to St. Louis in connection with the Illinois Central, an association road. From this ruling the Atchison promptly appealed. Subsequently the chair announced as his choice in the original appeal Mr. A. J. Smith, of the Lake Shore & Michigan Southern. Then the Atchison set up the claim that the chairman was barred from appointing an arbitrator, as he had not done so within five days from the receipt of the appeal from the decision. To this the chairman replied that the agreement provided that an arbitrator might be appointed within five days from the receipt of the ap-

peal and has refinements and novelties of detail which are not found in any of its predecessors, and which make it a noteworthy piece of engineering.

The road is of the three-rail type, the middle rail being common to the two tracks. There are two cars, fixed to the cable ends, one of them making a down trip while the other makes an up trip. Half way between the two road terminals is a turn out, enabling the cars to pass each other, the rails being turned to the right and left, and the road there becoming, for the length of the turnout, a regular double track line. The cable passes around hoisting drums worked by reversing engines at the upper terminal station, the steam, brake and reverse levers being arranged above the engine floor, so that a good view of the line can be had by the operator.

The road ascends the eastern slope of South Mountain. Its total length is about 7,000 ft., with a vertical rise of 1,630 ft., a maximum grade of 34 per cent., and an aver-

age grade of about 12 per cent. The gauge of the track is 3 ft.

Cable Connection and Safety Devices.—The manner of attachment of the cables to the cars, and the safety clutches which are a most important adjunct to the outfit, are of special interest and will be illustrated and more fully described in our next week's issue. For the present it will suffice to briefly explain that the two cables for each car are fastened to a double-pivoted metal disc placed underneath the car near its middle. This disc is designed to act somewhat after the manner of a whistle-tree on a wagon. So long as both cables are pulling equally, the disc remains in its normal position, but, should one of them break or stretch abnormally, so that the strain on the other is about doubled, the disc would be turned and would throw into action the safety clutch. The latter is entirely independent of

the ordinary brakes on each car and has three serrated gripping surfaces, one of which forms part of a pivoted dog. This dog is acted upon either by the disc to which the cables are secured or by a special speed governor. When in action the dog sinks its teeth into one side of the wooden guard rail placed between each outer and the middle line of rails, and thereby draws the other serrated surfaces against the other side and the top of the guard rail. The clutch then grips the guard rail on three sides and has a holding power equivalent to about 30,000 lbs., as demonstrated by actual test.

The speed of the cars is to be maintained at about 8 miles an hour, and the speed governor under each car is so adjusted that when, for any reason, the speed reaches 12 miles per hour, it brings the safety clutch into action.

Each of the engines in the power station is fitted with a strap brake, worked from the operating room above by a lever. The main hoisting drum, which is geared with the engines, is also fitted with a strap brake, and the latter will be connected with an automatic stop in such a way that in case the car going to the upper station should be accidentally allowed to overrun its proper travel, beyond the station platform, the brake will be promptly thrown into action, stopping the car and preventing any damage. This brake is also to be connected with a speed governor so that it will act automatically in case of excessive speed.

Signaling.—The two terminal stations are connected by telephone and electric gong-signals, and provision will also be made to have similar gong-signals in the cars so that a signal, rung anywhere on the line or in either of the stations, will sound at all four points. The signals to and from the cars will be transmitted by an electric brush made to come in contact with a copper conductor strung between the rails. With all these safety devices, the danger from accident has been reduced to a minimum.

Rolling Stock.—The cars, furnished by Jackson & Sharp, of Wilmington, Del., are built at an angle of 10 deg. 30 m. The measure, in clear length, 46 ft., in width 7 ft. 6 in., and have comfortable seating capacity for 75 passengers, though a maximum accommodation for 90 can be attained. They weigh 22,000 lbs. each. The seats are stationary, with curved backs, and are stoutly braced. They are counterparts of those used by Messrs. Otis Brothers & Co. in their elevators in the Eiffel tower. The ends of the cars are glazed; the sides are open, with sliding canvas curtains. On one side passengers are prevented from falling out by fixed iron crossbars, and on the other, or entrance side, by wooden bars, which are dropped into sockets when the passengers have entered and the cars are about to start. The cars have been named "Rickerson," after the president of the road, and "Van Santvoord," after the proprietor of the Day Line steamers. Each car is mounted on two four-wheel trucks, and has on each platform an ordinary wheel brake. The baggage cars are open, being simply platforms with sides but no tops.

Boilers.—Steam is obtained from two ordinary, vertical tubular boilers, rated at 150 H. P. each and carrying about 90 lbs. pressure. The boiler house is located at one side of the tracks, in front, and slightly below the level of the engine house. The position has been so chosen that the coal used can be brought up in the baggage cars on the line and dumped directly into the bunkers.

Permanent Way.—In laying the track over the greater length of the road, six mud sills were put down for every 30 feet of the three lines of stringers which are secured to them by drift bolts. To these stringers the wooden cross ties were bolted, and to these, finally, the 35-pound rails were spiked. Angle plates are used at the joints, and each has three notches cut in it, into which fit the three spikes which hold it down to the ties, thus helping to prevent creeping of the track. There are three trestles that have a total length of 2,572 feet and a maximum height of 72 ft., containing over 1,000,000 ft. of yellow pine timber. The road runs through four heavy rock cuts, one of them 45 ft. deep. For a distance of 1,000 ft. at the lower or east end of the line the rails are laid simply on cross-ties ballasted with broken stone.

With the exception of the turn-outs, the road runs in a straight line from end to end. The grade line is a combination of circular and parabolic curves, so designed that the cars balance each other when carrying average loads, at whatever point on the line they may be. In this respect the road is decidedly unique, and reflects, as it does in other respects, great credit on Mr. Thomas Brown, Jr., of New York, by whom it was designed and under whose supervision it was built.

The road was surveyed last December. Construction was begun in the latter part of January of this year and the line, as previously stated, was given over to traffic on Thursday of last week. Since then it has regularly performed the work of carrying passengers, freight and baggage from the valley to the mountain top, shortening the time of ascent and descent, as compared with the time on the hitherto used stage route, by more than an hour. Everything works smoothly and without a hitch. The total cost of the road and equipment was about \$275,000.

To Mr. Brown, the engineer, who also designed and erected the enormous Otis elevators at Weehawken, N. J., as well as those in the Eiffel Tower at Paris, primarily is due, as already intimated, the lion's share of the credit attached to the undertaking. He was ably seconded in his work, however, by an efficient staff of

assistant engineers and skillful and reliable contractors. The former comprised Messrs. Gaylord Thompson and Chas. F. Parker, of New York, and Mr. W. G. Howell, of Washington, D. C. The principal contractor was Chas. L. Bucki, of New York. Grading and earth and rock work was done by Pennell, O'Hern & Co., of New York. The tracklaying and the timber work was in the hands of Mairs & Lewis, of New York. The boilers and connections were supplied by the Q. N. Evans Construction Co., of New York. Messrs. Otis Bros. & Co., of New York, the well known elevator builders, to whom, as well as to their engineer, Mr. J. R. Furman and Mr. Thos. E. Brown, Jr., we are specially indebted for information, furnished the hoisting machinery, which was put up under the joint supervision of Messrs. Fred Grossman and Jos. T. Davies. The company's officers are Chas. L. Rickerson, President; C. C. Hager, Secretary and Treasurer, and Chas. A. Beach, Superintendent.

The illustration which we give represents a view from a point just in front of the upper station, looking down the line, and is reproduced from a photograph. The latter was taken some time before the completion of the road, and shows one of the construction cars in position, ready to pull the two cables down to the lower terminal. The boiler station is shown on the left, not yet housed in.

(TO BE CONCLUDED.)

The Hudson River Tunnel Railroad Terminals.

Late in July Mr. C. W. Buchholz, Civil Engineer of the New York, Lake Erie & Western, submitted to Gen. James H. Wilson a report upon the Hudson River Tunnel scheme, and more particularly upon the New York terminal. We are permitted to publish the following extracts from that report, together with a diagram illustrating Mr. Buchholz's plan for the New York terminal. It will be seen that his notion is original, simple and ingenious, and whether or not it is carried into effect it is a very interesting solution of a live engineering problem. What follows is verbatim from the report. We may add that the general design for the terminals has been elaborated with much skill and at considerable cost by Messrs. McKim, Mead & White, architects.

Recent improvements in the method of tunneling have removed the last doubt as to the perfect feasibility of tunneling the Hudson River between New York City and the New Jersey shore at Hoboken. The Hudson River Railway Tunnel Company has now in fact constructed and finished its tunnel to within a few hundred feet of the New York shore; and this tunnel is not a temporary hole only under the bed of the river, but it is a tunnel of permanent construction, capable of carrying with perfect safety any loads per running foot that are now carried by the leading and best railroads in this country. Under these changed and improved conditions the question of bringing the termini of all the railroads from Jersey City to New York has become at last worthy of serious consideration by the transportation companies and capitalists.

Having demonstrated, by completing one, the practicability of building and maintaining as many tunnels as are needed to carry to New York the enormous traffic now landed at Jersey City by six of the largest railroads in the United States, there still remain other very important questions to be solved satisfactorily before the railroad companies can avail themselves of the tunnels with advantage and profit.

The Terminal in New York City.—The location adopted for this terminus between Washington Square and Bleecker street and between Greene street and Sixth avenue is now unalterably fixed by the tunnel itself, by the money already expended and by the legal powers and privileges granted to the Tunnel Company; and taking everything into consideration, I do not believe that a better or more suitable site could be selected.

Men of little experience in the detail operation of a large railroad are even now suggesting and considering, apparently with entire sincerity, the possibility of bringing in trains into a central station in New York City, all the immense traffic, both freight and passengers, that is daily poured into Jersey City and its adjacent towns by three trunk lines and by three railroads of nearly equal importance. The impossibility of accomplishing this proposition will be apparent to everybody when it is considered that these railroad companies occupy now, with their docks, piers, stations and warehouses, more than four miles of the Hudson river front on the Jersey side, opposite the city of New York, and that every one of these six railroad companies has covered many hundred acres of land with its tracks for miles back from the harbor, for the purpose of having adequate terminal facilities to transact the constantly increasing business with New York. To transfer all this business to one central freight station in this city, or only so much of it as must find its way rapidly for immediate consumption or storage to warehouses and stores, without counting what goes directly for reshipment to vessels, and to do such business with dispatch, would require an area equal to that inclosed between the two rivers and between Fourteenth and Twenty-third streets, and would necessitate a network of track from one end of the city to the other, either above or below the streets.

There is absolutely no necessity or demand to deliver freight by such a method to New York. Manhattan

Island, with its great city, is phenomenally fortunate in its situation. Its narrowness and its length, accessible everywhere to deep draft vessels, to floats and barges, enables the transportation companies cheaply and quickly to deliver freight at the nearest point to the warehouse or store of the merchant. Very little hauling by teams would be necessary if the City of New York would improve its river front, and set apart for the use of railroad companies, at certain fixed distances around its whole circumference, the necessary piers and docks to be operated by one general terminal company, whose duty it would be to receive and deliver freights to any of these points and at any of the railroad depots in Jersey City.

For these reasons I have dismissed from the terminal question all consideration of freight traffic, and my plan embraces only the accommodation of passenger trains, with their baggage, express and mail coaches. Excepting the station of the West Shore, there are four large passenger stations in Jersey City and Hoboken. The total number of passenger trains daily arriving and departing to and from these stations now is 1,043. These trains reach and leave there upon 12 main tracks, and are distributed at the stations upon 40 tracks provided with a corresponding number of platforms. The land occupied by these four stations, by the platforms and tracks, excepting main tracks, by the sidings for the storage of cars, and by the engine houses and other necessary adjuncts for the proper handling of the passenger traffic, amounts approximately to 70 acres.

From these data it is almost self-evident that it would be a financial folly to attempt the construction of a central terminus in New York city large enough to accommodate all the passenger trains of these railroads, and upon the same plan as those now in use in Jersey City, known as the "head-house" system. It would be necessary to construct twelve tunnels, which alone would be sufficiently expensive to destroy the commercial success of the undertaking, without considering the great amount of valuable property to be purchased.

Fortunately the amount of travel coming from and through New Jersey to New York is very distinctly divided, and can never be concentrated at any one point with convenience to all the passengers. The great majority of "Commuters" or strictly suburban travelers, coming from a distance of perhaps 50 miles, have their places of business in the lower section of this city, and they can always be brought cheaper and quicker to their destination by the ferries. On the other hand, nearly all the people coming from greater distances will be admirably served by a station located as the one in question, since Washington Square is within easy reach of all the principal hotels as well as the stores.

These reasons have induced me to divide the passenger traffic and assume as a basis for planning the proposed station of the Tunnel Railway Company, that two-thirds of all the suburban trains will, hereafter as now, discharge their passengers at Jersey City. This would leave about 500 trains to be taken care of at present, and adding to this 50 per cent. as a probable increase during the next thirty years, tracks and platforms must be provided to handle with dispatch something like 750 trains in 24 hours.

To arrange satisfactorily for even this limited number of trains, seems almost impracticable on the common "head-house" plan, where all the tracks terminate abruptly at the end of a trainshed, and where every train discharged of its passengers must be shunted in the face of an arriving train, must necessarily cross the tracks of all departing trains, and must be broken up and made up anew before it is again ready for service. When to this great difficulty, which so much embarrasses the management of all such termini and which so strictly limits their capacity, is added the danger that in the case of the proposed terminus this shifting against the traffic must be done in a tunnel, it becomes imperative to devise some other method for transferring trains from the arriving to the departing platform, in order to make a success of the whole matter and to avoid the danger, the delay and the expense incident to the "head-house" plan or any plans heretofore suggested.

The plan herewith submitted shows in a general way such an arrangement of tracks and platforms as will, in my opinion, overcome all the objections outlined above, as well as any other criticism that may be advanced against a central passenger station in New York City. The tail switching system is not new, but the plan to divide the tail tracks in two, and to turn each half by means of curves in opposite directions and at right angles to the axis of the tracks at the platforms, has to my knowledge never before been suggested at a terminal passenger station. The plan is simple and its advantages are apparent and easily understood.

All incoming trains when emptied, are simply moved around a large Y, and when they arrive at the departing platform, all their cars and the motor pulling the same are relatively in the same position as they were when they came in, and every train is at once ready to start again upon its journey. Every possibility of collision at the entrance to the tunnels is hereby absolutely avoided, and the capacity of the terminus is limited only by the number of tracks leading to it.

The compactness of this plan is one of its features that most strongly recommends its adoption. Not more than 25 acres of land, including all the streets crossed, will have to be purchased and the position of the tracks and platforms below the street surface is such that every

inch of this area can again be utilized and built upon for private uses, except upon such portions as are necessary for waiting rooms, offices, etc., in connection with the station.

Considering the rapidity with which trains can be moved through the proposed station by this plan, it will be entirely uncalled for to provide in this city numerous and extensive tracks for the storage of empty cars. These cars can be kept, cleaned and repaired, either at a new yard to be built immediately west of the Jersey end of the tunnel, where land is comparatively cheap, and where the surface can be used, or at the present yards of the different railroads using the tunnels. The distance from Washington Square to the west end of the tunnel will not exceed two miles, while the storage yard and engine houses of the New York Central & Hudson River Railroad Co. are four miles from its passenger station in New York City, and those of the Pennsylvania Railroad Co. in Philadelphia are more than two miles from its overcrowded station in that city.

The plan submitted provides for sufficient track room to hold about 225 cars, which in my opinion is ample for the use of such trains as are by the nature of their service compelled to be idle for a few hours during the day, or such trains as must be kept over night to be ready for use early in the morning. All the other trains will either be kept in motion on their short suburban trips and simply pass through the station, or they will be taken to Jersey City when empty, to be cleaned.

tunnel and for the terminus, but it would seriously embarrass the determination of a practical motive power; while on the other hand, an easier grade would add largely to the cost of constructing the tunnel, the approaches and the station in New York City, without materially simplifying the question of the motor to be used.

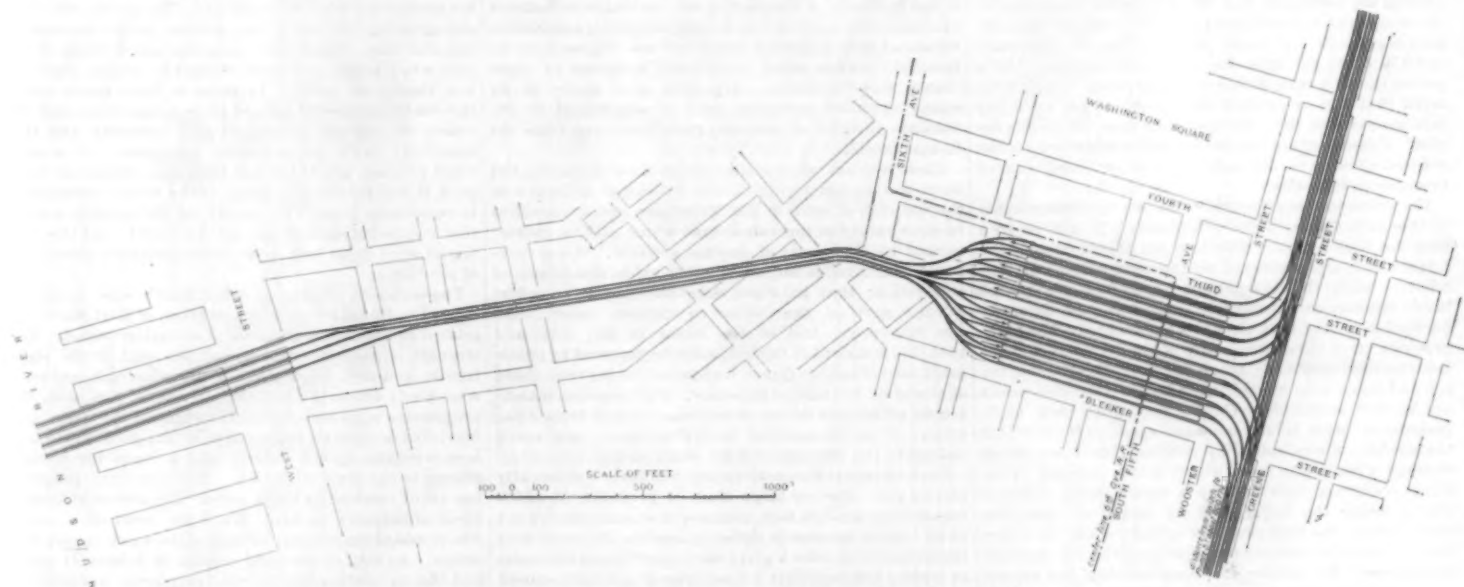
Of course a slight deviation from the figures above given will not practically change the results, and may be found necessary during construction, after a more thorough knowledge of the formation of the bed of the river on the New York shore has been obtained.

Motive Power.—For many reasons the steam locomotive is entirely out of the question. It would be impossible thoroughly to ventilate these long tunnels, when filled with smoke and gases, and the escaping steam and sulphur and the scattered cinders and ashes would all combine to make the platform underground where the passengers are landed, intolerable; besides, the heavy weight of the engine itself would test the stability of the best of tunnels, constructed through the soft silt, which forms to a great depth, the bed of the Hudson River. There is in my mind no doubt that for the tunnels themselves, and for their immediate approaches, cables driven by large stationary engines would give the best satisfaction. The ability of rapidly moving heavy loads by cable has been demonstrated by practice for many years on inclined planes in the anthracite coal fields of Pennsylvania, and the experience on the Brooklyn Bridge Rail-

Standard Paints on the Chicago & Northwestern.

The Chicago & Northwestern has found after several years' experience that it can make all the paint used on its lines much cheaper and of a better quality than it can buy it. Mr. George M. Davidson, Chemist and Engineer of Tests, began in a small way a few years ago the manufacture of some of the standard paints, and was so successful that the company has built at its West Fortieth street shops a large building devoted entirely to the manufacture of paint. This building is equipped principally for the manufacture of mineral paint from the raw material. The raw material is brought from the company's mines in carload lots.

The process of manufacture is about as follows: The raw material is first run through a crusher, breaking it up into small lumps that would probably pass through a sieve of a $\frac{1}{2}$ in. mesh. It is then put into an oven, where it is roasted. By first crushing the mineral it is thoroughly roasted, and uniformity and permanency of color are ensured. After cooling, the mineral is shoveled into a hopper and is conveyed to a Raymond pulverizing machine. The ore is dropped upon the wings of this machine, which revolves at the rate of about 2,800 revolutions per minute. The construction of this pulverizer is such that the mineral in falling against the wings is reduced to a powder so finely broken up that it is carried in suspension in an air current through the box surrounding the machine into an air-



PROPOSED TERMINAL FOR THE HUDSON RIVER TUNNEL RAILROAD.

By C. W. BUCHHOLZ, C. E.

The capacity of a railroad terminus is measured, not only by the total number of trains that are handled there during a day of 24 hours, but by the number of trains that can be dispatched through it during the busiest hours of the day, say from 7 to 10 a. m. and from 3 to 7 p. m.—Guided by these considerations, the proposed design contemplates the construction of four main tracks across the river, leading to 20 tracks and 10 platforms under the station building. This arrangement will give the terminal a capacity of dispatching with ease 60 trains per hour in both directions, assuming the speed through the tunnel at 15 miles per hour, and assuming two trains in each of the four tunnels at the same time.

A demand for transportation to reach this ultimate capacity will perhaps not be made at once upon the tunnel railway company, but it is sure to be made in the near future, if this undertaking can be carried out to its full completion, as outlined above, and nothing less will make it a permanent success. One tunnel alone, although perfect in its construction, would be of no practical value to the steam railroad companies, and two of them would accommodate not more than half of the traffic that would be offered, while all the terminal expenses in New York city would have to be nearly as large as the outlay necessary to carry out the whole scheme with four tunnels.

Gradients.—Having decided upon the location of the New York terminus, very little choice remains in the determination of the maximum grades that must control the approaches to the tunnel. Considering the desirability on account of the nature of the soil to have the body of the tunnel as far as possible below the bed of the river, and taking into account the necessity of having the tracks under the station at a level, and as much above low water as the elevation of the streets above them will permit, I have concluded that it would be best to concentrate the grades and to make them rather short and steep than long and gradual, without losing sight of the motive power to be employed or the nature of the traffic to be moved. The elevation of the existing tunnel has, of course, also to some extent controlled the fixing of the maximum grade, and 2.25 ft. per 100 ft. has been adopted as being the best result that can be obtained after carefully weighing the whole subject.

A steeper grade would perhaps be better for the

road is unquestionable evidence that passenger trains can be hauled over heavy gradients very successfully by cable.

The difficulty arises when trains arrive at the New York terminus, after the cable is let go by the motor car. Some effective means must be found other than the steam engines to pull the train to the station and to shift it from there to the storage tracks or to the departing platforms. I would strongly recommend the use of a compressed air engine as best adapted for the purpose. Such an engine should be constructed in a manner so as to form an integral part of the motor car carrying the grip for the cables, and must be so arranged that when the grip is released from the cable the engine can at once be put into operation and continue the movement of the train to its destination.

The air engine has, however, the advantage of being a compact machine, carrying its power like the steam locomotive upon its own wheels, capable of moving freely in any direction over any of the numerous tracks and crossovers incident to a large railroad terminus. The only valid objections that have heretofore been urged against a more extensive use of the compressed air engine are its expensiveness and the inability to store sufficient air for long distant travel, necessitating numerous plants of stationary engines. Both of these objections are not pertinent under the conditions here considered, since the use of the proposed engine will be very limited, and since its reservoirs can be supplied with fresh air at both ends of the tunnel, where under any circumstances large stationary engines must be erected, and where the addition of a few air compressors will not add greatly to the cost of running them.

Connections at Jersey City.—No serious difficulties exist to interfere with the construction of a perfect connection from the approaches of the tunnels to all the railroads terminating in New Jersey.

The New Jersey Junction Railroad, running on the eastern side and at the foot of the Bergen Hills, does already connect the Pennsylvania and the Erie Railroads with the West Shore Railroad and can cheaply be connected with the D. & L. & W. and the Central Railroad of New Jersey and the Lehigh Valley Railroad by means of the National Dock Company's Railroad.

tight settling box connected directly with it. The volume of this settling box is so much greater than that of the pulverizer that the current of air through it is more sluggish, consequently the heavier particles of the mineral dust fall to the bottom, and they are then carried back to the pulverizer by a conveyor. The finer mineral is conveyed by the current of air from the settling box by means of tubes into the settling rooms. These settling rooms are three in number, and the tube which carries the dust into the first one terminates in a dust collector similar to that used in sawmills. The coarser particles are collected in this room. In the dividing partition between this and the next one is an opening about two feet square, which is the only communication between the two rooms. The dust that floats into this room is further screened by means of coarse bagging hung along the lower end of the partition dividing the second and third rooms. The dust that collects in the first room is quite finely divided; that in the second room is a finer quality, and that which finds its way into the third and last room is an impalpable powder. At the upper part of this third and last room is a pipe leading to the Sturtevant blower which supplies the current of air to the pulverizing machine.

The mineral that settles in these various rooms is collected separately in barrels, and is used to make the various qualities of mineral paint. The plant for mixing the paints consists of two large mixers having a capacity of about four barrels each. This class of paint is used in very large quantities; in fact, the mill is behind its orders. In two other smaller rooms leading from the main mixing room are placed the mills for grinding the coach and inside finishing colors.

The standard colors turned out from this mill are very uniform. In order to simplify the ordering of paints and filling requisitions the company issued in July, 1890, a list of standard paints, calling them the "C. & N. W. Railway Co.'s Standard Paint No. —," following which is given a description of the paint and for what purpose it is to be used. The paint is made in paste and liquid form and is delivered in barrels, kits or sealed cans, according to the quantity and quality needed. All mineral, freight car, depot and house paints are delivered in barrels. Inside colors are usually made in

paste form, delivered in kits, and the coach colors and finer qualities of inside paints are put into sealed cans. The power for this plant is supplied by a Keystone automatic engine of 80 H. P.

Compound Locomotives in France.

It will be remembered that the Northern Railroad of France has been experimenting to some extent with compound locomotives for several years. In the June number of the *Revue Générale des Chemins de Fer*, M. du Bousquet, Superintendent of Motive Power, gives some results obtained from a four-cylinder, receiver compound which was built in 1885, and a description of two four-cylinder compounds which have recently been put into express service.

The first compound of this type was illustrated in the *Railroad Gazette* of Jan. 3, 1890 (fig. 6). During the six years which this engine has been in service it has run 134,900 miles, burning 28.2 lbs. of coal per mile. For the same period the coal consumption of the single expansion engines in the same service was 33.5 lbs. per mile, showing the saving in fuel by the compound to be 15.7 per cent. The best of the simple engines used about 3.5 lbs. of coal per mile more than the compound. The compound gave some trouble on account of heating of the rear axle journals, which are beneath the firebox. This is given as the reason for the increased quantity of lubricants used by the compound, which is 6.56 lbs. per 100 miles, as against 5.82 lbs. for the simple engines. Including the increased cost of lubricants, the saving by the compound was \$174 per year. The cost of maintenance is given at 3.71 cents per mile for the compound and 3.75 cents per mile for the simple engines. Altogether this is a remarkable showing when it is remembered that the compound has nearly twice as many moving parts as the corresponding type of simple engine. Reasons given for this superior endurance are the reduced stresses in the axles, frames, etc., and reduced pressure on the valves.

The accompanying illustration shows the construction of the new four-cylinder compounds. It will be seen that the high-pressure cylinders are placed outside the frames and are connected to the rear pair of driving wheels, while the low pressure cylinders are placed inside the frames, beneath the smokebox, and drive the forward axle, and that the axles are coupled. The high-pressure valve chests are on top of the cylinders and the low-pressure chests are at an angle of 45° between the top and outer side of each cylinder, so that the valves are readily accessible. On its way from each high-pressure cylinder to the common receiver, from which the low-pressure cylinders are supplied, the steam passes through a three-way cock, which is the starting valve. These cocks are operated by a small steam cylinder placed under the boiler, and by means of them the exhaust from the high-pressure cylinders may be either directed into the receiver or exhausted directly into the atmosphere. To further facilitate starting, the cranks of the high and low-pressure pistons on each side are placed at an angle of 102° instead of at 180°, which would be the best for smoothness in running.

The principal dimensions of these locomotives are as follows:

Diameter of high-pressure cylinders.....	13.4 in.
Diameter of low-pressure cylinders.....	20.9 in.
Stroke of all pistons.....	25.2 in.
Ratio of cylinder volumes.....	2.42
Ratio of volume of receiver to that of both high-pressure cylinders.....	1.36
Diameter of boiler shell, smallest inside.....	49.6 in.
Thickness of plates.....	0.709 in.
Tubes, 202, 1.77 in. diameter, length, 12 ft. 9.5 in.	
Heating surface, firebox.....	117 sq. ft.
Heating surface, total.....	1,211.5 sq. ft.
Grate surface.....	22 sq. ft.
Diameter of driving wheels.....	83.2 in.
Weight on driving wheel.....	67,240 lbs.
Total weight, loaded.....	105,380 lbs.
Boiler pressure, per sq. in.....	109 lbs.
Maximum receiver pressure, per sq. in.....	85.3 lbs.

These locomotives have been in service since August and September, 1891, and have given very satisfactory results. During the months of February, March and April, 1892, the average coal consumption per mile was 32.0 lbs. for the compounds as against 37.4 lbs. for simple engines in the same service. The compounds used 13 per cent. less lubricants than the simple engines. One of the compounds has made the run from Paris to Amiens, 81.4 miles, in 90 minutes and the other has run from Paris to St. Quentin, 95 miles, in 2 hours.

Legal Theories of Price Regulation.*

A sale presents two distinct aspects, according as we regard it as an individual transaction affecting buyer and seller alone, or as one among many transactions which furnish the means of supplying the market with commodities in the necessary quantities for consumption.

The Roman law looked solely at the former aspect. It treated the transactions as something which only concerned the buyer and seller. Each was free to make what terms he pleased. The *jus abutendi* was sufficiently wide to cover cases where a man sacrificed his

property below its trade value, no matter under what conditions. Nowhere has the doctrine that a man is absolute master of his own property in these respects been carried out so consistently as in Rome. Such a state of things was only possible where law was highly developed and commercial transactions but slightly so. In ancient Rome both of these conditions existed to a marked degree. The Romans were able to command the products of the world by the compulsory labor of slaves at home and the taxation of people who were little better than slaves abroad. The rich did not need to sell; the poor did not need to buy. Under these circumstances price was a matter of trifling importance compared with that fixity of tenure on which the Roman organization rested. We find far less mention of markets or of trading and of the police regulations which necessarily govern them, in the world-wide transactions of imperial Rome than in the much more restricted ones of Athens a few centuries earlier.

In Medieval Europe the state of things was wholly different. There the property law was much less highly developed, while the commercial transactions, though small in proportion to those of the present day, had a large importance as compared with those of the Roman empire. The land owner was not at all likely to transfer the title to his land—as society was then constituted, he often could not do it at all—but he felt the necessity of exchanging the products of his land for those of artisans or craftsmen. Under such circumstances the question of price regulation assumed much greater importance than it had in Rome. A transaction was no longer an isolated exchange, but a part of the work of supplying a market in which all producers to a greater or less degree were interested. Under these conditions a change of legal theory was inevitable. Attempts were made to fix prices by public authority, without any regard to the absolute theories of property right inherited from the Roman world.

There was not much system about these attempts, but there was an underlying theory, developed at length in the writings of some of the schoolmen and exemplified to some extent in the canon law, which may be characterized as the theory of *justum pretium*. It was supposed that articles had an inherent value, due to cost of production; that in every sale there was an effort on the part of the seller to receive more than the just price, and of the buyer to pay less; and that this standard of fairness must be enforced by public sentiment if not by direct legislation, to prevent abuse of power on one side or the other. The economic reasoning on which this theory is based was derived from Aristotle. It is exemplified to-day without very much change in the writings of Karl Marx and his followers.

Even in feudal times the theory was never consistently carried out. For one large class of products, of which wheat furnishes the best instance, it was not carried out at all: partly because in different seasons the amount of wheat resulting from a given amount of human labor was so wholly different that a fixed price would have caused scarcity in one year and left large quantities unconsumed in another; still more, because that the sellers of the wheat were the people who had most to do with making the laws. If the price of wheat were only high enough to cover the cost of production, there would be little left for the land owner. He was bound to get what he could. He charged what the traffic would bear. In years of plenty he got comparatively low prices for large quantities of goods; in years of scarcity, when he could get the higher prices, he was by no means inclined to relinquish the opportunity.

In the case of manufactured articles, custom and police regulation had very much more to do with the price. The conditions of manufacturing changed but slightly from year to year. The amount of capital involved was so small that there was a well defined relation between product and labor expended. Yet even here the prices seem to have been fixed in many instances by the guilds rather than by the public, by sellers rather than by consumers. Intermediate between agriculture and manufactured products we find articles like bread or ale, where there was an attempt by police authority to fix a sliding scale of prices, adjusting the weight of the farthing loaf to the price of wheat in different years. As time went on, the most important instances of the adjustment between price and cost of production lay rather in the attempts to fix the rate of compensation for labor, of which the history of England from the reign of Elizabeth on furnishes such notorious examples.

In the great majority of these cases it will be seen that the theory of the *justum pretium* was made a pretext for a class legislation rather than for anything which should be conceived in the interest of the people as a whole. It was on this account that the courts, taking wider interests in view, were forced to restore the common law system of regulation of prices by free competition. At first this may seem like a return to the old Roman law theory. Its practical effect was the same in nine cases out of ten; but the grounds on which it was established, and on which it is to-day defended are radically different from those which were dominant in the minds of Roman lawyers. The Roman law allowed free determination of prices as a consequence of the unrestricted right of private property. The common law encouraged it as a means of supplying a market more fully and fairly than could be done in any

other way. The common law, both in its rules and its exceptions, recognized the public commercial end, which the Roman law did not.

The common law development was closely connected with those improvements in the arts which necessitated the investment of capital. The law of the thirteenth and fourteenth centuries had been essentially unfavorable to the speculator. The action of intermediaries in trade was discouraged just as far as possible. The laws against forestalling, regrating, and engrossing, or, in modern terms, against futures and corners, were universally and consistently enforced. But as time went on the legitimate uses of capital became more important. The artisan with capital displaced the craftsman; the employer displaced the artisan with capital; centralized employment in factories displaced the scattered home industry. Each of these things marked a step in public economy. Under the new system it was possible to supply the market with more goods at less cost than could possibly have been done under the old. In a less conspicuous degree the same change took place in agriculture. With the development of scientific farming the man who improved his land not merely served himself better, but served the public better than the man who kept on with the old methods and tried to sell his goods at the old prices.

The investment of capital was most speedily secured by encouraging speculative employment of labor; in other words, by allowing the owner (or borrower) of capital to manage his industry as he wished, and to sell his product for what he could get. The guilds were not strong enough to resist the general public interest in this direction. Customary prices became a thing of the past when progressive men wished to supply goods at less than those prices. In order to have goods cheap the one thing needful seemed to be competition, and the courts of England recognized this necessity and this possibility with praiseworthy quickness. If a man could produce goods for less than had previously been paid, it was for the advantage of the whole community to encourage him. The supply in the market was in this way increased and the price lowered, and this was bound to go on as long as the price remained above cost of production.

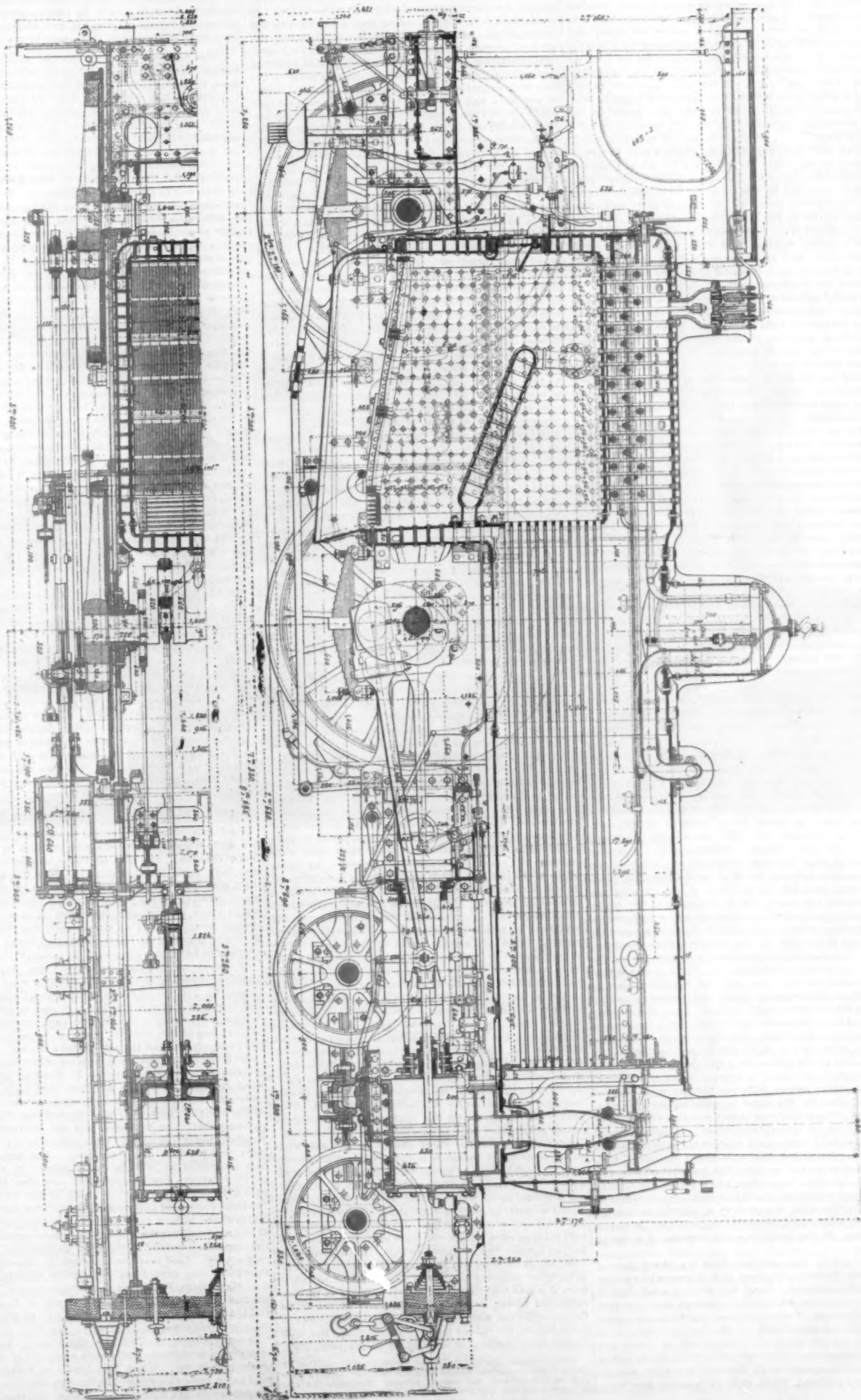
The economic theories of Adam Smith were as closely related to this state of things as those of Karl Marx are related to the class legislation of an earlier period. The strength of political economy at the end of the eighteenth and the beginning of the nineteenth centuries was chiefly due to the fact that it was in line with the progressive legal and political thought of the times, and furnished at once an explanation of the good which had been wrought by law reform and a basis for further change in the same direction. But this legal progress has about reached its limit, under the technical conditions of industry to-day. We have reached a point where added investment of capital does not insure fair prices. As long as the fixed capital is relatively small and the circulating capital relatively large, competition will never permit rates to be much above cost of service and will cease when rates fall below that standard. But if the capital charges are large, as in a modern factory, or still more clearly in a consolidated railroad system, the standard which will bring in new capital is very much higher than that which will cause existing capital to contract its operations. The automatic character of price regulation, as it was produced by competition a hundred years ago, is now apparently gone, and in some measure, though not so far as is generally supposed, it is gone in reality.

The underlying idea of the English law on prices is clearly seen in the first efforts to meet this evil by compulsory competition. Instead of simply saying that capitalists may compete with one another, the courts and legislatures tried to say that capital *must* compete. This effort takes an indefinite number of forms—sometimes by subsidizing new concerns or encouraging them by special methods of taxation; oftener still by laws against combinations, intended to prevent those concerns which already exist from acting in harmony with one another. But the evil is too deep to be remedied in ways of this kind. If it is more economical to have the business of a community done by one concern than by two, efforts to insist on the independence of two concerns are in the long run futile. If it further happens that the mercantile competition of two concerns side by side will drive rates below cost and leave nothing to pay interest or maintenance, such competition, even if temporarily established, cannot exist indefinitely. If it acts at all points as with competing iron furnaces or rolling mills, we have bankruptcy, loss of capital and ultimate centralization. In short, all the most marked phenomena of a commercial crisis. If it exists at some points and not at others, as in the case of a railroad, we have discriminations of the worst kind, usually in favor of the man who least needs encouragement. Instead of securing one price for all persons and all times, the artificially stimulated competition produces fluctuations of the most marked character from place to place and from year to year.

The alternative to enforced competition seemed to be found in limiting prices by charter maxima. It had always been recognized by the common law, that there were certain industries where competition was impracticable if not impossible. These had been subject to special regulation or law. The practice cannot be better summed up than in the words of Lord Hale, in his treatise

* By Prof. A. T. Hadley, Yale University, in the *Fale Review*.

No man who thinks about the ever-present question of governmental control of railroad rates can fail to be interested in this learned, philosophical and remarkably clear paper. That must be our excuse for giving it so much space, if any excuse were needed.—EDITOR RAILROAD GAZETTE.



tise *De Portibus Maris*, two centuries ago—words, which are rarely quoted correctly, but which furnish an extremely comprehensive basis on which modern practice is developed. "A man for his own private advantage may in a port or town, set up a wharf or crane, and may take what rates he and his customers can agree for crannage, wharfage, housellage, pesage: for he doth no more than is lawful for any man to do, viz.: make the most of his own. . . . If the king or subject have a public wharf unto which all persons that come to that port must come and unlade or lade their goods, as for the purpose because they are the only wharves licensed by the king . . . or because there is no other wharf in that port, as it may fall out where a port is newly erected, in that case there cannot be taken arbitrary and excessive duties for crannage, wharfage, pesage, etc., neither can they be enhanced to an immoderate rate. But the duties must be reasonable and moderate, though settled by the king's license or charter. For now the wharf and crane and other conveniences are affected with a public interest, and they cease to be *juris privati* only; as if a man set out a street in new buildings on his own land, it is now no longer a bare private interest, but is affected with a public interest."

Of such methods of price regulation, canals furnished the most important instances during the last century. Their maximum tolls were fixed by charter; and the same thing was done at the beginning of the present century in the case of railroads. These methods of regulation proved inoperative, because the prices actually charged were so much lower than any one had contemplated at the outset. The toll which would have given a fair remuneration with the small volume of traffic contemplated at the outset could be reduced by the carrier for the sake of increasing the volume of traffic, and was actually very much reduced. Since, however, the reduction was made greater for some persons than for others, the cheapening of the rates was accompanied by an arbitrary power on the part of the carrier to produce inequalities between different persons and places. And as already shown, the effort at enforced competition increased rather than diminished these inequalities by reducing rates to the lowest level in some cases and leaving them absolutely in others. To insist that the companies should take full toll in all cases was obviously not to be thought of. There remained but three alternatives:

1. To leave the rate-making power in the hands of the property owners or their representatives, but insist on equality in charges. This was the English policy.
2. To establish schedules of rates by public authority, and let the amount of service adapt itself to the conditions thus imposed. This is exemplified in the Granger legislation.
3. To let the government control, not only the rates, but the investment of capital, whether by guarantees or by direct ownership—a policy toward which Germany has moved rapidly.

The first efforts of the English courts in the direction of enforced equality were extremely crude, and the decisions conflicted with one another to a great extent. To the mind of some judges, equality of railroad charges meant equal mileage rates, by which freight should be charged twice as much for a distance of 200 miles as for a distance of 100 miles, an obviously unfair method which unnecessarily increased the cost of long distance shipment. To other judges it meant, that different kinds of goods should be taxed at the same rate for maintenance of way or other elements of toll; a result not so obviously unfair, but of even worse practical consequence, since it would prevent the reduction of rates to develop traffic in a cheap article unless all the traffic of the railroad were developed enough by a similar reduction to compensate for the loss of revenue on each shipment. To others it meant that the railroads had no right to treat a remote place as favorable as they treated a nearer one; that geographical position was a vested right, and the limit of authority conferred upon railroads was to be found in property rights existing elsewhere. But the attempt to carry the law too far in any of these directions resulted in its nullification by the companies; and the courts gradually confined their attention to cases of clear and conspicuous inequality, where different persons were charged different rates for the same or substantially the same shipment. The underlying theory was that the men who were in charge of railroads or other monopolies, should have the right to make such rates as they pleased within the charter limits, but that as common carriers, if they made a reduction for one man they were bound to accord the same reduction to another, and whether the circumstances and conditions of the two men were the same or essentially the same was clearly a judicial as distinct from a legislative or administrative question. It was an application of the traditions and theories of common carriers.

It must not be supposed that there is a sharp line of distinction between England and America in respect to methods employed. There has been a good deal of judicial regulation in America, though less effective than in England. There have been a good many efforts at legislative readjustment of charges in England, of which the present attempts of the Board of Trade are the most important. The difference lies in the fact that the successful regulation in England has been almost exclusively judicial, while that in America has been

the work of administrative bodies. The American legal development dates from 1871, the time when the reaction against over-construction of railroads was beginning to make itself felt. By the aid of land grants, municipal subscriptions, and other unwise devices to encourage artificial growth, we had prepared ourselves for a practical experience of the failure of the theory of enforced competition. The farmers had moved to a point where they were exceedingly dependent upon railroads; prices of products had fallen so low that the railroad rate which allowed the farmer to pay interest in 1880 did not do so in 1872; the clamor for compulsory revision of rates became irresistible, and a series of crude laws, generally known as the Granger Laws, were passed in most of the states in the upper Mississippi valley. The railroads resisted this legislation on the broad ground of unlimited property rights. They were defeated on the ostensible basis of Lord Hale's opinion already quoted. Nobody doubts, however, that the decision of the courts would have been the same if Lord Hale's opinion had been different, or if Lord Hale himself had never lived. It was one of those practical makeshifts which, like the jury system, prevent our laws from being too good for the people who live under them. As against the position of the corporations, however, the grounds for the decision were a little stronger than they seemed. The claim of the right of a railroad to make rates just as any other business man would make rates was not one which could have been well established in precedent, and the courts took advantage of this unwise claim on the part of the railroad attorneys to decide the case adversely to them, without much regard either to the inherent logic of the opinion or to the probable consequences which might be deduced from it.

The immediate results were not so bad as a great many people expect. The decision was delayed till 1877, and by this time railroad development was sorely needed, and Western states were finding it necessary to encourage the investment of capital. It was also a time when railroad rates for outside causes were falling rapidly in states where there was no legislation whatever. As a result of these things the authorities were not especially anxious to enforce the schedules of 1873 and 1874, nor were the railroads, in the majority of cases, specially concerned to resist them. In 1883 and 1889 conditions had changed. The central western states had been pretty fully supplied with railroads, and did not, for the moment at any rate, feel the need of encouraging any more. The authority which had lain unused by legislatures and commissions was now exercised relentlessly; while the pooling clause of the Interstate Commerce law deprived the railroads of the power of self-defense and forced them to rely on the courts for protection.

The railroad companies' ground to-day is wholly different from that which they adopted in 1873. They no longer pretend that their business is just like any other business, nor deny *in toto* the right of public authorities to say something about rates; but they deny the unlimited right of such authorities to make unreasonably low rates. The question has been fought out on this issue, and decided by the Supreme Court in the case of *Minneapolis Eastern vs. Minnesota*, and *Chicago, Milwaukee & St. Paul vs. Minnesota*, in favor of the railroad contention. The courts, in other words, do not allow the legislative authorities an unlimited power to make what rates they please, any more than they were willing 13 years previously to accord the same right to the railroads. This result will not seem strange. It is much stranger that there should have been a strong dissenting opinion,* and that the Interstate Commerce Commission in its annual report for 1890 should give the weight of its authority against the position taken by the courts. There are certain pages of that report which might almost be said to scold the courts for assuming to have anything to do with the matter. The theory of the Interstate Commerce Commission as developed in its report is, that the making of rates is an administrative and not a judicial function; that many of the questions which enter into a railroad rate are not those of precedent and interpretation, but of probable business effect in the immediate future; that the courts cannot intelligently decide those questions; and that, therefore, if the legislature has any authority at all to make such decisions or to delegate the power to make them to any one else, such authority is absolutely unlimited. This part of the report shows the looseness of reasoning to which people have become habituated in modern times. It says rightly that the court cannot readily deal with such questions; it therefore assumes without hesitation that the legislature has an unlimited power to deal with them. What makes matters worse is that in many of the practical cases which would arise such legislation would necessarily be class legislation. The railroads of the West are owned in the East. A Western state legislature making rates within the state represents the shippers as against the property owners. While it may be true that in the long run any legislation which recklessly sacrifices property rights will react against the shippers, it is also true that there is grave danger in leaving unlimited power to the representatives of one to be chosen under the methods by which legislatures, or even commissions, are chosen to-day. Where there has been no such local conflict of interest, as in Massachusetts,

* Fisher Ames once said, that the government of the United States is like a raft; the people who are on it are always getting their feet wet, but never getting drowned. In the Granger cases they got their feet very wet.

legislative regulation has not been accompanied by grave abuses. Where there is such a local conflict, only the courts have been able to furnish protection to the different interests represented, and even they have had hard work in producing this effect to any adequate extent.

If the position taken by the Commission, or by the minority of the Supreme Court in the Minnesota railroad cases, were generally accepted, the alternative between destructive class legislation and consistent socialism could not help being squarely presented in the immediate future. Nor could it be confined to railroads alone. The character of railroad discriminations and railroad legislation is only in a moderate degree due to special physical conditions affecting that industry alone. It is due to the combination and consolidation of capital which is making itself felt in other lines of industry. The technical conditions of the railroad have simply caused things to develop a little earlier here than they do anywhere else. Under the present system, in spite of many abuses or possibilities of abuse, we have at least a division of powers: the administrative power in the hands of officers of the corporation, the judicial power in the hands of the courts. We have a most important counterpoise to the evils of unrestricted democracy from the fact that large departments of human life are administered, not by representatives of universal suffrage, but by representatives of property. By giving the courts the function which has been established in England we are able to treat the making of rates as an administrative power without recklessly sacrificing capital on the one hand or endangering democratic institutions on the other. There is every reason to hope that the price regulation of the future may take more and more the direction of securing equality rather than of fixing rates. The general schedule of prices has hitherto been made lowest, and the general efficiency of labor highest by encouraging the investment of capital and letting it be managed by the men who have charge of it; and there is the strongest reason to believe that these general results still hold good. The individual cases of hardship can be remedied by judicial action defining similarity of conditions and circumstances, rather than by legislative maxima which would attempt to provide for unknown contingencies in favor of the consumer and against the investor.

To sum up: The Roman theory of absolute property rights is untenable in a commercial community. The feudal theory of fixing prices by public authority on the basis of custom is still more untenable. The English common law theory of voluntary competition works extremely well in industries with small capital and independent establishments but is subject to important limitations where there is a *de facto* monopoly. Compulsory competition has proved impracticable; charter maxima have been inoperative. We are reduced to the three alternatives of socialism, class legislation, or judicial enforcement of equality on the basis of private initiative in rate-making. The dangers of each of the two former bring us down to the latter as the only visible line of development which will not sacrifice more than it gains.

Separation of Grades on the Pennsylvania Railroad.

The Pennsylvania has decided to abolish a large number of the worst grade crossings on the line of its New York Division. The first of these is where some of the New York Division cross the main line at Thirty-sixth street, Philadelphia. The contractor for this under grade crossing of the main line is P. McManus, 1404 South Penn Square, and the work is now well on toward completion. This was recently described in the *Railroad Gazette*. At Englewood station heavy masonry abutments have just been built in order to carry Oxford street above the tracks of the New York Division. The contractor for the masonry work is Andy Brann, No. 1743 North Seventeenth street, Philadelphia, and Benner & Opdyke, 226 South Fourth street, Philadelphia, have the contract for the iron superstructure. The expense of this crossing is being borne jointly by the Pennsylvania and the city of Philadelphia. Next in order is the dangerous grade crossing of the North Penn division of the Philadelphia & Reading at North Penn Junction. Frequent meetings have been held between the officers of the two companies and the City of Philadelphia, and it has been decided that the Pennsylvania shall raise its tracks and the Philadelphia & Reading lower its tracks, thus removing an exceedingly troublesome grade crossing. The expense of this improvement will be borne jointly by the City of Philadelphia, the Pennsylvania and the Philadelphia & Reading. In 1890 the grade of the New York Division was raised from a point about 1,000 ft. west of Harrowgate Station to Frankford Junction, a distance of about two miles, thus removing grade crossings of two important streets, Kensington avenue and Frankford avenue. Last year four streets in the vicinity of Frankford were graded under the tracks, namely, Orthodox, Margaretta, Frankford and Bridge streets. Work has just been commenced at the crossing of Longshore and Unruh streets, Tacony, and they will be placed under grade this summer.

Through the City of Elizabeth the Pennsylvania will construct a temporary trestle work alongside of the two tracks now in use. When this trestle is completed a solid earth embankment will be built on the line of the present tracks and when this is finished the trestle will

be removed and the embankment widened for four tracks. At the crossing of important streets heavy masonry abutments will be built to support iron girder bridges and thus remove all grade crossings of streets. The Central of New Jersey is about to commence the work of lowering its tracks at the crossing of the Pennsylvania, and this will be pushed simultaneously with the elevated road of the Pennsylvania.

Through the City of New Brunswick the contemplated changes have not yet been definitely adopted, but it has been decided to add two tracks to the bridge crossing the Raritan River, making it a four-track railroad bridge instead of two-track as at present.

Vauclain Compound Engine-Manitou & Pikes Peak Railway.

The Manitou & Pikes Peak (rack) Railway has recently received from the Baldwin Locomotive Works a Vauclain-compound, Abt, rack-rail locomotive. It is designed to push 25,000 lbs. up a 25 per cent. grade. The

from the momentum of the reciprocating parts. The mechanism of the new engine is decidedly different from the earlier ones, and it has been adapted to remove almost entirely the pulsations which were so noticeable and disagreeable to passengers in the first locomotives. Some of the engines on the Pikes Peak road have been adapted to burn oil; the one just described burns coal.

The Eiger Mountain Railroad.

There seems to be no end to the number of Swiss mountain railroads. A line to the top of the Eiger is now under consideration. The Jungfrau road, once much spoken of, is not to be built because its promoters could, or did, not furnish the required evidence that the contemplated rapid passage from the lower to the higher and rarefied atmospheric strata would be unattended by danger to prospective passengers.

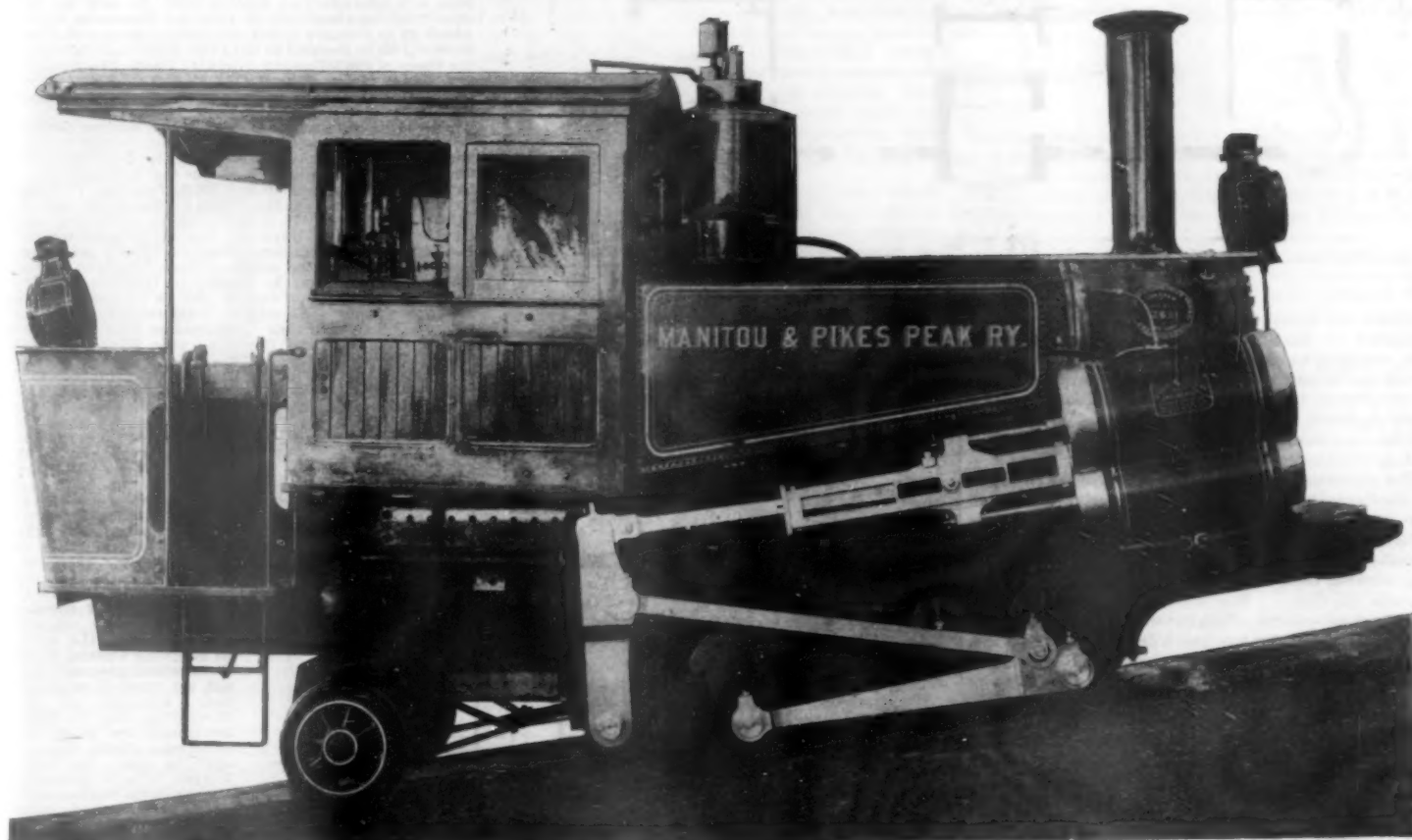
In the case of the Eiger road any possible trouble from such rapid ascent is to be avoided by having two intermediate stations. The road is to be made up of two sec-

The Locomotive Question in New South Wales—Some Reminiscences.

BY ONE WHO WAS IN THE MIDDLE OF IT.

A dozen years ago New South Wales had its locomotive question as it has now, but at that time the special object of abuse was the English locomotive and the basis of all the complaints, then as now, was political. The railway department more than any other state department was a sort of happy hunting ground for politicians, and occasionally the legislature would have a virtuous fit and it would be resolved that the railways should be worked free of all politics, and they would appoint some man to a good post to carry the new policy into action.

At the time referred to, the man appointed was brought out from England, where he had had anything but a high class record, but he was well recommended by a firm of locomotive builders, who acted as wet nurse to him on their part in return for what he could do them on his part; and of a truth he tried real hard to serve them.



FOUR-CYLINDER COMPOUND LOCOMOTIVE FOR THE PIKE'S PEAK RACK RAILROAD.

Illustration from a photograph shows an engine with four carrying wheels and a two-wheeled, swing-bolster truck. There are two geared driving wheels, the centres of which are forged solid with the axles of the carrying wheels. The cylinders are of the Vauclain compound type, and are connected to the driving axles by means of a lever, pivoted at its lower end to the frame of the engine and an intermediate connecting rod and the usual side rod. The carrying wheels are larger than the driving gears, and are arranged to revolve on their axles and are held in position by collars forged on the axles. The cranks and crank pins are forged solid and pressed on axles outside of the frames.

Specifications.

Gauge.....4 ft. 8 1/2 in.
Cylinders, high pressure.....15 in. x 22 in.
Cylinders, low pressure.....15 in. x 22 in.
Geared driving wheels.....22,400 in. over pitch line.
Carrying wheels.....22 in. diameter.
Truck wheels.....22 in. diameter.
Wheel base, total.....11 ft. 0 1/2 in.
Wheel base, driving.....4 ft. 9 1/2 in.
Boiler of steel.....42 in. diameter.
Tubes of iron, 156 in number.....1 3/4 in. diam., 7 ft. 6 in. long.
Firebox of steel.....36 1/2 in. long, 51 in. wide.
Tank.....400 gallons capacity.
Weight in working order, total.....45,850 lbs.
Weight in working order on drivers, 33,200 lbs.
Driving wheel tires fastened to centres by Abt's patent springs and keys.
Carrying wheel tires bolted to centres.
Screw reverse gear.
Nathan lubricator.
U. S. metallic packing for piston rod and valve stems.
Slab frames with open hearth steel pedestals.
Band steam brake applying to main axle.
Band hand brake applying to main axle.
Water brake applying to cylinders.
Two headlights.

The first engines built for this road, described in the *Railroad Gazette*, Feb. 6, 1891, were not wholly satisfactory, as they conveyed to the car longitudinal pulsations and oscillations that were quite disagreeable to passengers. These pulsations were due to the manner in which the gears were connected, and there was a lack of uniformity in the turning moment of the drivers. The speed of the engines was considerably in excess of the revolution of the drivers, and oscillation resulted

tions. The first of these is to be an ordinary rack road with an average grade of 15 per cent., and is to run from the starting point, Scheidegg, to Rothstock, the latter being at an elevation of about 7,725 ft. above sea level. The second section will run through a tunnel, reaching the summit of the mountain in almost a straight line, and will be operated by cable, in two divisions. One of these will be 3,603 ft., and the other 5,576 ft. long. This arrangement of stations will necessitate two changes of cars on the part of the passengers.

The summit of the mountain has an elevation of about 13,022 feet, and will afford sufficient room for a station, thus offering a notable advantage over the summit of the Jungfrau. Passengers who may have any apprehension as to the effect on them of the rarefied atmosphere at the summit may discontinue the journey when they reach either of the intermediate cable stations. Access from the latter, which are to be at heights of 9,800 feet and 11,332 feet above the level of the sea, is to be had to the open air, and will thus afford opportunities for magnificent views without necessitating going to the summit.

At the middle of the upper, and at the upper terminal of the lower, cable section, respectively, a stationary motor is to be placed. The maximum grade of the upper section will be sixty per cent. Water power will be used in a turbine station to generate an electric current, and the latter will be led to the driving motors by a 6 mm. (2.4 in.) copper wire. Semi-portable steam engines and boilers will be provided at the stations on the line of the road to serve as auxiliaries in case of need. The rails will be laid on iron cross-ties resting on and anchored to a beton foundation. A line of stairs, with hand railing at the tunnel wall, will be provided at the side of the track for inspection purposes. The cross section of the tunnel is to measure 7.87 ft. by 23 ft. The cars are to be fitted up with two platforms, and are to have five compartments, each capable of accommodating eight passengers. They are to be lighted electrically. Automatic brakes, which will come into action in case of cable rupture, are to be used.

His first step was to pick a quarrel with an old servant: then he tried to oust everyone who had not been engaged in England with his pet people; he quarreled with the Railway Commissioner and tried to turn out of the service an engineer specially appointed by the Minister for Public Works simply because he was afraid of the younger man's better abilities. He capped matters by appointing a drunkard who was a personal friend as chief draftsman and made himself generally detested by endeavoring to lower wages to the same nominal figure as in England, though money in the colony had only half the purchasing power it had in England. Then he put every possible obstacle in the way of the Colonial locomotive builders who tendered for new engines; and for locomotives ordered in England he sent home specifications and tracings from drawings which were supplied by his pet firm at home so that they might have the best chance of securing the orders. He treated every one with the greatest rudeness, and finally was sacked before the expiration of his agreement, the affairs of his department having come to utter demoralization. He accomplished absolutely nothing in the way of simplifying matters, and it was a treat to see the Western train leave Sydney in a morning. Long cars, short cars, medium cars, American cars; cars with four wheels, six, eight and twelve wheels; one engine English, the other American. There were engines with leading coupled wheels, trailing coupled wheels, Bloomers, old singles with outside cylinders, six-coupled and consolidation passengers with four-wheel trucks, and with pony trucks, swing bogies and Bissel trucks.

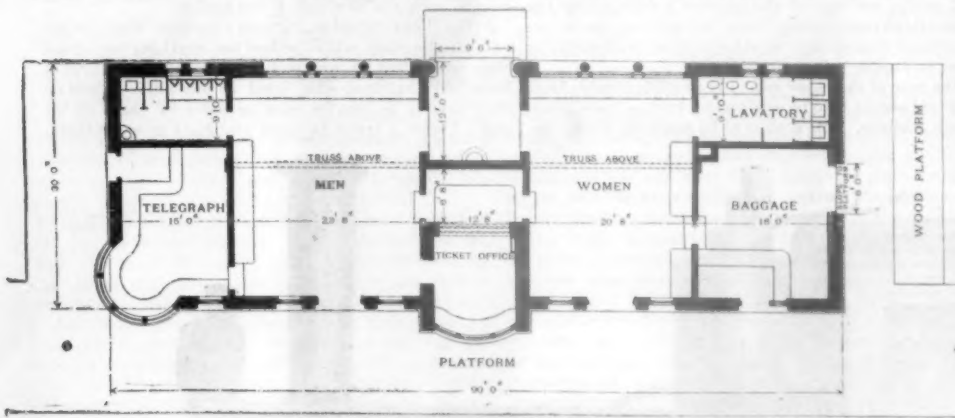
Apropos of one of the charges against Mr. Eddy, it may be said that twelve years ago, when the first consolidated engine came along, it was necessary to chip some of the walls in Sydney yard to let the buffer beam clear, and over the mountains the station platform edges had to be sawed off to clear the cylinders, for the engines had been ordered very thoughtlessly, as also were certain cars, which would not pass the tunnel at Redfern. Probably the state of affairs is not far different

now from what it was in those earlier days. Things seemed serious enough, no doubt, to those mixed up in them, but at this distance one can laugh at the rough and tumble of colonial experiences, and remember, in the midst of so much that was harassing, the fairness and geniality of the then single commissioner, Mr. Goodchap.

LONDON, July 25, 1892.

Railroad Improvements in Elizabeth, N. J.

The Central Railroad of New Jersey has recently opened to public use its new station at Elizabeth, N. J., which is about completed. This station, which is,



Ground Plan—South Building.

perhaps, the largest on the main line of the road, was designed by Mr. Bruce Price, of New York, and with the surrounding improvements forms part of the new work necessitated by the proposed elevation of the Pennsylvania tracks which cross the Central at that point on grade. As both roads are four-track, and over 500 trains a day pass this crossing, it will be seen that it is a dangerous and costly place.

The plan accepted by the city consists in the elevation of the Pennsylvania tracks through the city, making all street crossings below grade, and on the part of the Central changing their grade from Broad street to Elizabethport station, and depressing all street crossings between these points, Broad street alone remaining a grade crossing.

The old union depot, which has served its purpose since 1855, and of late years has been a discredit to both roads, is being torn down. The Pennsylvania will use a temporary station on the West Grand street side until its new station, which will probably be on the point of East Broad street, is erected.

The Central Railroad's improvements consist in the depression of the Union street crossing at the west end, and the construction of the station buildings and platforms and a passenger tunnel at the east end, all of which are shown on the accompanying plan. Access to the station and platforms is had from Union street, by inclined driveways and steps. The platforms are of concrete, and are roofed over for their entire length of 725 ft. on either side of the tracks. The station proper consists of two buildings, one story in height, that on the south side being the larger, and this is surmounted by a tower 87 ft. in height to the top of the vane, having a large clock just below the roof.

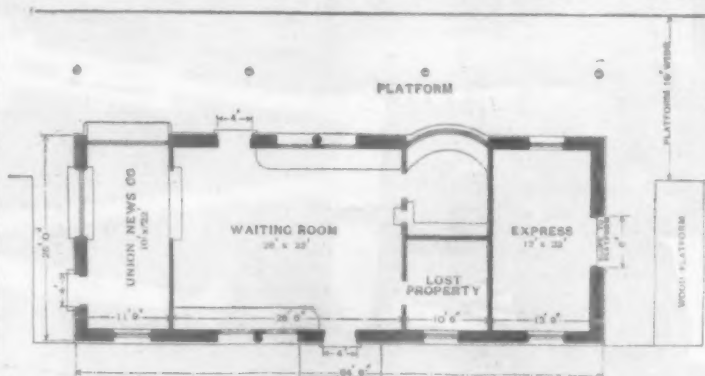
The buildings are of pale brick with stone trimmings and slate roofs. The building on the north side of the tracks, which gives access to the west bound tracks, is

25 x 64 ft. 6 in., outside dimensions, and contains a waiting room, 22 x 28 ft., express room 12 x 22 ft., news company, and lost property rooms.

The main building gives access to the east bound tracks and is 30 x 60 ft. over all. It contains the men's waiting room, 23 ft. 8 in. x 27 ft. 6 in., the women's waiting room 20 ft. 8 in. x 27 ft. 6 in., lavatories, ticket office, baggage room and telegraph office. The dimensions and design are shown on the ground plans given. At the north end the platforms are to be connected by a tunnel under the tracks so that passengers need not cross the tracks on grade. This tunnel will be similar in design to those in use by the Pennsylvania at its Market Street,

Newark, and Rahway stations. The entire cost of the station and surroundings will be about \$90,000.

The Pennsylvania has made the contract for the elevation of its tracks through Elizabeth. The first step will be to raise the two south tracks to the new grade on



Ground Plan—North Building.

trestle work and turn the traffic over these tracks. Then the permanent work will be begun on the elevation of the other two tracks.

Standard Time in Europe.

Standard Time has been virtually adopted in Europe. It is in use on 55,438 miles of its railroads. Austrian and German guides recognize the following time divisions for Europe: Greenwich time (West Europäische Zeit, abbreviated W. E. Z.) for the British Isles, Holland,

Belgium, France, Spain and Portugal. Long. 15° E., Middle European time (Mittle Europäische Zeit, abbreviated M. E. Z.) for Sweden, Norway, Denmark, Germany, Switzerland, Austro-Hungary, Italy and Serbia. Long. 30° E., Eastern European Time (Ost Europäische Zeit, abbreviated O. E. Z.) for European Russia, European Turkey, Roumania, Bulgaria and Greece. Austro-Hungary was the first country to authorize its railroads to use the system. The change was made on Oct. 1, 1891. The new time is employed in the postal and telegraph service of that country, as well as by its army and navy. On Oct. 1, 1891, the Roumanian roads also adopted Standard Time (O. E. Z.). Serbia and Bulgaria soon followed. Turkey has adopted M. E. Z. time for the Zibefche-Salonique line, and O. E. Z. time for the Belova-Constantinople line. Previous to April 1, 1892, the railroads of Southern Germany used the local times of Carlsruhe, Stuttgart, Munich and Ludwigschafen, and also the mean local times of every place of any importance in Alsace-Lorraine. To-day these railroads all use M. E. Z. time. On May 1, 1892, the reform was introduced on all the roads of Belgium and Holland. The Swedish roads have used the hour of long. 15° E. (M. E. Z.) since January 1, 1879. St. Petersburg time, which differs only one minute from O. E. Z. time, is in force on the Russian roads. In North Germany, the reform is to take effect on April 1, 1893. To sum up, the number of the standards of time for European roads, which up to January 1, 1891, was twenty-four, will at the close of 1892 be reduced to the three great standards and the times of the following capitals: Paris, Madrid, Lisbon, Rome, Bern, Athens, Copenhagen and St. Petersburg. Dublin time is used in Ireland and Christiania time in Norway.

In introducing standard time in their various departments the governments have left the people free to adopt it or not. In Austro-Hungary the question is still under consideration in Vienna, but the following cities have adopted standard time: Villach, Teitschen, Troppau, Salzburg, Brünn, Omütz, Cracow, Lemberg, Fiume, Trieste, Budapest. It is also in use in Bosnia and Herzegovina. In Bavaria, Baden, Alsace-Lorraine, Belgium and Wurtemberg almost every city of importance has now adopted standard time. Holland has as yet taken no action in regard to the reform. The delay is practically caused by a dispute as to which hour they shall adopt—Western European time or Central European time. Amsterdam time is 20 minutes ahead of Western European time and 40 minutes behind Central European time. Naturally the former would be selected. A Mr. Hühreht, a professor of Utrecht, however, has argued with some effect in behalf of the latter. We reproduce here two or three of his arguments.

"Central European time," says the professor, "would be much healthier than Western European time in that under it one would rise 40 minutes earlier than formerly, while under the latter one would rise 20 minutes later. Then, too, work done in the morning is better than that done at any other time of the day—therefore we should hasten to meet the morn by adopting Central time. Switzerland generally has not yet adopted standard time, although all the navigation lines on Lake Constance are using it. Otherwise Bern time is still in use. In Italy, Rome time governs, though in the North standard time has many friends. In France, Paris time has been established by legislative enactment. It is to be hoped that that country will soon see fit to join hands with the other countries in this matter.

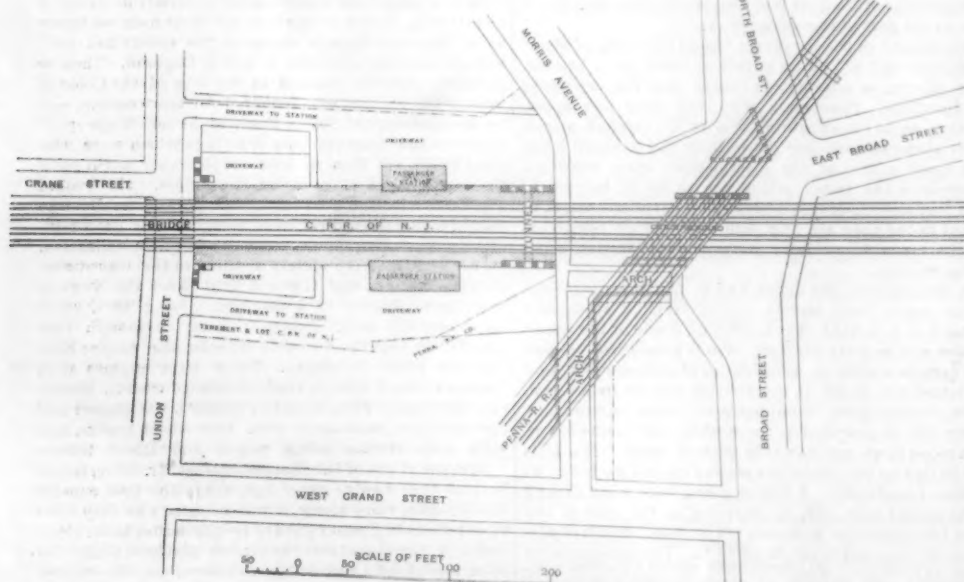
In a pamphlet recently published by Mr. L. DeBusschere, chief engineer of the Belgian State Railways, from which the above information is extracted, an account of this interesting and important movement is given in detail.

Of the twenty-four standard hour meridians which compass the earth the following are now used for governing railroad time. In Europe the prime (Greenwich) meridian, the 15th and the 30th degrees of east longitude; in America the 75th, 90th, the 105th and the 120th degrees of west longitude; and in Asia (Japan) the 135th degree of east longitude. The 60th degree of west longitude is used in Halifax and the 135th degree in Sitka. Of the others the 15th and 30th degrees of west longitude are almost entirely in the Atlantic Ocean. The 150th and the 165th degrees of west longitude, the anti-meridian (180 deg.), 165th and the 150th degrees of east longitude are in the Pacific Ocean touching the continents only at Alaska and Kamchatka. Deducting these seven which are so located as to make it impracticable to use their times, we find that of the seventeen whose times may be used as a standard ten are already employed for that purpose. The reform has certainly made rapid progress since this country set the example and established its practicability in 1883, less than nine years ago.—*Travelers' Official Guide.*

The Fifth International Congress of Interior Navigation.

The Fifth International Congress of Interior Navigation was opened in Paris July 22 by the Minister of Public Works. He was surrounded by officers representing the Corps of Bridges and Roads, the Chamber of Commerce of Paris, the Department of Public Works and the Department of State, and the President of the Republic was represented by an Aide.

The first International Congress was held in Brussels in 1855, the second in Vienna in 1886, the third at Frankfurt in 1888 and the fourth at Manchester in 1890. The session of the Congress which would naturally have been held in Paris in 1889, sat under the name of "A Congress for the Utilization of Rivers." This allowed some enlargement of the scope of the Congress in the direction of irrigation and water distribution. The subjects proper of the Congress have always been the question of international statistics of navigable waters, the consideration of methods of improving estuaries, power



Plan of Railroad Improvements at Elizabeth, N. J.

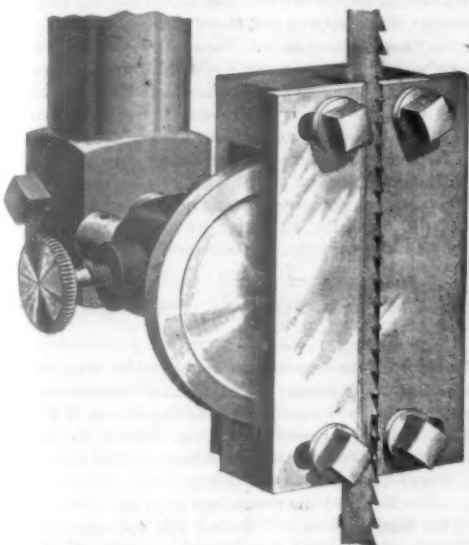
Note: The Pennsylvania tracks will be elevated to cross those of the Central of New Jersey over grade.

traction on canals, comparison of the systems of locks, lifts and inclined planes in overcoming differences of elevation, the organization of water traffic, and, finally, statistics of the financial results of operation. Aside from these subjects, the Fifth Congress takes up matters of a more strictly engineering nature.

Mons. Viette, Minister of Public Works, opened the first session in a happy speech, in the course of which he claimed that the canals of Mars indicate that there exists on that planet a polytechnic school. A considerable part of the sessions, so far as we have reports, was devoted to the question of tolls upon canal and river traffic. Many papers were presented and speeches made on this subject, and a resolution was passed to the effect that such traffic should be subject to the lightest possible tax and that special tolls can be levied, in default of public means, to pay expenses that are strictly of a sort to favor the development of navigable waters and of the fleets upon them.

Special Improved Band Saw Guide.

We show a cut of a new device for band saw machines which has valuable points, and for which it is claimed



that it prevents saws breaking, has extra long side guides to keep the blade from twisting or running, is adjustable in all directions, does not require frequent lubrication, does not groove or wear out of shape, does not heat the saw, does not disturb the temper or change it, fits any machine and any saw blade.

The roller is made of hardened steel and is attached to a steel spindle running in a close fitting sleeve and so arranged that all bearings are easily oiled and secured from escape. The frame holding the side guides is adjustable for the various widths of the blades by means of the thumb-screw. The back of the saw blade has a long bearing across the face of the roller, thus distributing the friction over the largest surface possible, which diminishes the breakage of saws through heat and friction. The side guides are extra long and of hardened steel, supporting the sides of the saw blades in the most approved manner, and which results in an improved action of the saw in many ways, especially with respect to breakage and twisting or running. The side guides are adjustable sidewise, with a wrench, and are movable to the blade or from it as desired to suit the various widths of saws, so that at all times the saw blade is held rigid the full width and close to the teeth. This is made by the Egan Co., Cincinnati, Ohio.

Notes on British Train Speeds.

I.

The considerable interest recently aroused in America, England and elsewhere by the reports of the long distance special fast run on the N. Y. C. & H. R. Railroad and by the admirable daily performances of the Empire State express on the same system, has induced the writer to give in this and the following articles a brief résumé of the work done by the locomotives of the fastest railways in Great Britain. No attempt has been made to compare British performances with American, and considerably more attention is given to what is actually done than to what is set down in the time tables for the trains to do. The railways chosen to illustrate the best express work are: The Caledonian; the Glasgow & South Western; the Manchester, Sheffield & Lincolnshire; the Great Northern; the Midland; the London & North Western. On these six systems the fastest and best express work in England and Scotland is done. Speeds are high, trains are heavy and gradients are steep.

THE CALEDONIAN.

Generalities on Train Service.—This is perhaps the most important line in Scotland. Its main route, connecting at Carlisle with the North Western system, runs north to Stirling, Perth and Aberdeen. Branches leave this main track at Carstairs for Edinburgh; at Law Junction, for Glasgow and Greenock, and at Perth for Dundee. The most important passenger traffic on the line is

that from England to the towns just mentioned. This traffic is very large, especially in summer, and demands running a large number of express trains. Two other routes compete for it from London, and owing to one of them having a shorter route than the North Western & Caledonian these latter companies have to run very hard over their mountainous routes. The table below shows the train services afforded by the company from its southern termination northward:

Between Carlisle and—	Distance miles.	No. of trains at or over 40 miles an hour.		Fastest.
		Down.	Up.	
Glasgow.....	102½	4	4	15
Greenock.....	129½	1	None	6
Edinburgh.....	100½	4	4	6
Perth.....	150½	4	1	17
Dundee.....	174½	3	1	55
Aberdeen.....	210½	2	1	30

Some of the above trains, especially the fastest from Carlisle to Edinburgh, Glasgow and Perth, have to run at 48 to 50 miles an hour, booked speed, between intermediate stopping stations. Perhaps the stiffest booked run on the system is that of the down, day, Scotch express from Carlisle to Carstairs, 73½ miles, in 86 minutes. This equals 51½ miles an hour over a very heavy course, the gradients of which are described below, together with details of actual observations made on the running of this train.

Locomotives and Train Loads.—The company chiefly employ a 6 ft. 6 in. four-coupled class of bogie engines with 18 x 26 cylinders and just over 30 tons (English) available for adhesion. These engines take most of the fastest trains, but two special engines (Nos. 123 and 124) each forming a class by itself, run regularly with the other type. Their dimensions are as under:

Dimensions.	Engine No. 123.	Engine No. 124.
Driving wheels, diameter.....	7 ft. (single).	6 ft. 6 in.
Cylinders, in.....	18 by 26	18 by 26
Heating surface, tubes, sq. ft.....	250.30	1,068
Firebox, sq. ft.....	102.38	132
Grate area, sq. ft.....	17½	19½
Boiler pressure, lbs.....	150	150
Weight available for adhesion.....	17 tons.	30½ tons.
Total weight of engine in working order.....	41 tons 9 cwt.	45 tons.

Train-loads are very heavy on the Caledonian, ranging from 150 to 250 tons on the fastest expresses. This is exclusive of engine and tender. Generally, even on the fastest and heaviest trains, time is kept, and all unpunctuality is due to delays at stations.

Actual Performances (with Particulars of Gradients).—We give below details of a performance of the down day Scotch express. The run was in no way a special one, but was simply such as this train probably performs every day.

ENGINE 124.—WEIGHT OF TRAIN (EXCLUSIVE OF ENGINE AND TENDER), 175 TONS.

Station or Mile Post.	Time due.	Time actual.	Time taken for intermediate miles in seconds.	Gradients.
Carlisle mile-post.....	p. m. 4:30	h. m. s. 4:40:33		
5.....	4:46:36	99, 79, 69, 63, 62.		Gradual descent.
10.....	4:51:38	59, 57, 57, 62, 67.		2 miles easy descent and 3 miles up at 1 in 200
15.....	4:57:48	72, 72, 74, 76, 76.		3 miles up at 1 in 200.
20.....	5:03:12	68, 62, 61, 63, 68.		Undulating.
25.....	5:08:38	70, 73, 68, 57, 58.		Rises 1 in 200 for 2 miles, then falls at 1 in 200.
30.....	5:13:18	57, 56, 56, 55, 56.		Easy descent.
35.....	5:18:25	57, 60, 64, 64, 62.		Gradual ascent.
40.....	5:24:08	62, 64, 70, 72, 75.		Rises at 1 in 200 and then 1 in 165.
45.....	5:39:17	85, 102, 113, 126, 129.		Rises at 1 in 85, 1 in 80 and 1 in 75.
50.....	5:44:19	133, 133, 134, 135, 127.		Rises at 1 in 75 to the summit, whence there is a gradual fall all the way to Carstairs (23½ miles).
Carstairs' Loop (73½ miles).....	5:56 p. m.	6:07:11 p. m.		

THE GLASGOW & SOUTH WESTERN.

Generalities on Train Service.—This small railway performs the same offices for the Midland as the Caledonian does for the North Western, taking on the Midland trains from Carlisle to Glasgow and the southwest of Scotland. The route is longer than the rival Caledonian line, and consequently some very fast trains are run, as may be seen from the table below:

Between Carlisle and—	Distance Miles.	No. of trains at or over 40 miles an hour.		Fastest.
		Down.	Up.	
Glasgow.....	115½	3	3	27
Greenock.....	129½	2	2	3

The fast expresses from Carlisle to Glasgow are gener-

ally timed at about 50 miles an hour on the level piece from Carlisle to Dumfries. From Dumfries to Kilmarnock is a moderately heavy road on which pilot engines are occasionally employed to assist the heavier expresses. The best trains are nearly all allowed 70 minutes for the 58½ miles or just under 50 miles an hour. From Kilmarnock via Barrhead to Glasgow, the expresses are booked at about 48 miles an hour over an exceedingly heavy course. A run on each of these sections from actual daily practice is given below, together with particulars of the gradients to be surmounted.

Locomotives and Train Loads.—The locomotives on the Glasgow & South Western are a very powerful lot on the whole. The latest class, which works most of the express traffic to-day, has dimensions as under:

Heating surface: Tubes, 1,105 sq. ft.; box, 101 sq. ft.; total, 1,206 sq. ft.; grate area, 16 sq. ft.; boiler pressure 150 lbs. per sq. in.; weight available for adhesion on four coupled wheels, 29 tons, 2 cwt.; total weight of engine in working order, 43 tons, 11 cwt.

Three other classes, however, occasionally take their turn with the fast trains. Their dimensions are as under:

Class.	Description.	Driving wheels.	Cylinders.	Remarks.
Passenger.....	Four coupled	7 ft.	18 by 26	Bogie
".....	"	6 ft. 9 in.	18 by 26	Bogie
".....	"	6 ft.	18½ by 26	Bogie

The train loads on this system are generally heavy. A few of the fastest trains are rather light, however. Pilot or assistant engines are employed to a certain extent, although, rather curiously, they are seldom seen on the steepest section of the line, viz., that from Glasgow to Barrhead.

Actual Performances (with Particulars of Gradients).—As mentioned above, we append here particulars of three runs made in ordinary practice on the Glasgow & South Western.

Stations.	Miles.	Carlisle to Dumfries in 36 min. 7 sec. (33 miles) with engine 63 and 12½ coaches (150 tons).		Particulars of gradients.
		Time due.	Time actual.	
Carlisle.....		p. m. 6:13	h. m. s. 6:31:33	
Rockcliffe.....	4		6:40:26	43
Florisdon.....	6		6:42:53	57
Gretna.....	8½		6:45:10	57
Gretna Green.....	9½		6:46:19	52
Dornock.....	14½		6:51:42	56
Annan.....	17½		6:54:40	61
Ruthwell.....	24½		7:1:46	59
Racks.....	29½		7:6:32	60
Dumfries.....	33	6:52	7:11:00	50

Stations.	Miles.	Dumfries to Kilmarnock in 65 min. 7 sec. (58 miles) with engine 53 and 13½ coaches (162 tons).		Particulars of gradients.
		Time due.	Time actual.	
Dumfries.....		p. m. 2:05	h. m. s. 2:21:32	
Holywood.....	3½		2:26:40	41
Auldgrith.....	7½		2:31:25	51
Clovenstone.....	11½		2:35:04	52
Thornhill.....	14½		2:39:30	48
Carrnbridge.....	17½		2:44:05	43
Sanquhar.....	26½		2:53:50	54
Kirkcubbin.....	29½		2:57:33	53
New Cumnock.....	37		3:06:03	53
Old Cumnock.....	42½		3:11:19	61
Auchinleck.....	44½		3:13:20	61
Mauchline.....	48½		3:17:15	60
Hurlford.....	56½		3:24:30	62
Kilmarnock.....	58	3:15	3:26:39	49

Kilmarnock to Glasgow (St. Enoch), in 32 min. 42 sec. (24½ miles, with engine 89 and 17½ coaches (210 tons).

Stations.	Miles.	Time due.		Time actual.	Speed in miles per hour.	Particulars of gradients.
		Time due.	Time actual.			
Kilmarnock.....		p. m. 3:19	h. m. s. 4:4:45			
Kilmarnock.....	24		4:8:57	32		Rises at 1 in 180.
Stewarton.....	5½		4:14:48	33		Rises partly at 1 in 87 and partly at 1 in 152.
Dunlop.....	7½		4:19:00	32		Rises at 1 in 75.
Lugton.....	10		4:21:53	47		Gentle descent.
Caldwell.....	11½		4:23:46	48		Gentle ascent.
Nitshill.....	18½		4:30:51	50		Descends at an average of 1 in 70.
Kennelhead.....	19½		4:32:12	56		Easy descent.
St. Enoch.....	24½	3:50	4:17:27	51		Easy descent.



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EDITORIAL ANNOUNCEMENTS.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

The members of the Station Agents' Association want to change their masters; at least their spokesman Mr. Wright, of Cleveland, gives the newspapers which are short of "telegraphic" news a short dissertation on the subject, arguing that it would be better for agents to be directly controlled by the Traffic Manager rather than by the Superintendent. Some agents are practically thus controlled already, but Mr. Wright's constituency is composed chiefly of agents who are "bossed" by both these officers (not to mention several others), and he doubtless voices the sincere sentiment of many of them, for the traditions and customs of the traffic department are in many respects more attractive to the ambitious station agent than are those of the operating department. The General Passenger Agent appreciates any increase of business an agent may secure, and may be disposed to listen to his plea for a corresponding increase in pay. The General Freight Agent has a somewhat intimate knowledge of the efforts agents have to put forth to retain business (not to mention increasing it), and so is likely to set a higher value on their services than would the Superintendent. These considerations alone are enough to make Mr. Wright's arguments attractive to his members, for most of them certainly deserve better pay if they properly fill their positions. But he is not likely to effect any change in existing arrangements. A station agent at a small or medium station has a hard place, for the company cannot afford to hire separate men for the different departments, and he must therefore serve two or more masters, who sometimes pull in different directions. But the Superintendent has the more important claim on his time and services, and so will continue to be his immediate commander; for, notwithstanding the skill, energy and experience required to secure business, the more important thing is to handle it after it has been secured. A company might, by doing perfect service, secure much traffic without fighting for it, but it cannot work a week without careful men to attend to the trains. An agent's services in keeping switches safely set, and in attending to his other duties in connection with trains; in caring for passengers and seeing to the efficient conduct of work at the freight house, are a vital part of the operation of the road; but soliciting freight and passengers is a relative matter. At some places it is much more important than at others. The Superintendent must have a safe man at every station to protect the lives of passengers and guard the company's property, while the Traffic Manager would not suffer irreparably if he should hire a man who proved faithless both to the traffic and the transportation departments.

Last Sunday an accident happened on the Brooklyn Bath & West End Road, a passenger line between New York and Coney Island, which might have been serious, but which fortunately did not result in loss of

life. Of course, the Sunday traffic to Coney Island is immense. A train leaving the landing at Bay Ridge, consisting of five cars, all heavily loaded, passed the junction at West Brooklyn, where six cars coming from Brooklyn were to be taken on; these cars were also heavily loaded. They approached on a descending grade and the engine hauling them out was cut off, making a flying switch, leaving the cars to run by their own momentum to the rear of the standing train. The three brakemen on the six cars failed to reduce the speed, and when they saw that a shock of greater or less severity was inevitable, some or all of them jumped off. The result was that there was a collision of some severity, and a number of persons were injured by being thrown upon or against the seats, but a good many more were injured by jumping off in a panic, the cars being open at the sides like summer street cars. In all the injured were about 20, the most severe injury reported being one broken leg. There are two points worthy of note in this occurrence—the recklessness of the railroad and the ignorance of the newspapers. All the New York papers that we have seen, except one, say that "the brakes refused to work," thus repeating the old cry, heard in every case where speed is not controlled, which deceives and alarms the public without any adequate explanation. All brakes, hand or power, automatic or non-automatic, are held up as dangerous contrivances, and the mechanical department of railroads receives unmerited blame. One paper, the *Tribune*, gave what is doubtless the true explanation: a brake chain broke and it then appeared that that one brakeman was trying to control the whole six cars. He shouted to his fellows, but they did not or could not respond quickly enough. Without discussing here the necessity of using good brake chains and of inspecting them with care, it is enough to say that five cars with good brakes ought to be readily managed so as to control the speed of six. If automatic air brakes were in use on the train it was of course the duty of the company to have an air valve so arranged that the foremost brakemen could, in an emergency, apply the power to the whole train: this is now the practice of the most enterprising roads in handling passenger cars which have no engine in front of them. But this point is overshadowed by a more important one, which is, that cars containing passengers should not be moved unless there is an engine attached to them. This is now the unwritten rule on many of the best roads, and the Fitchburg, whose new code we noticed two weeks ago, has put it in black and white, under rule 117, which is a good example for other roads to follow. The trouble with the Coney Island railroads seems to be that they regard street car methods as applicable to the heavy cars and higher speeds of standard railroads. They have cheap roads and cheap cars, but their fares are not very low and the speed of the trains is pretty high, so that there is no apparent reason why the State should not hold them to as high a standard of safety as that to which the other railroads of the state are held.

The excursion of Knights Templar to Denver this week, for which the principal railroads interested have been preparing for many months, is one of the chief railroad events of the year. The work of carrying 50,000 passengers, more or less, over such long distances, where most of them must go in sleeping cars, is in itself a large problem. It is reported that 104 trains passed through Kansas City in one day, August 6. This figure is doubtless "subject to correction," but the use of baggage, and even freight cars, for passengers, shows that the rush was great. One report from Denver says that many passengers rode standing for hundreds of miles. But this great movement, exceeding anything ever before known west of Chicago, is made possible largely by the low fares (a trifle over half a cent a mile), and it is this feature that occasions the most active discussion. One phase of this appears in a contribution on another page. Another appears in the following, taken from a Philadelphia paper:

Vice-President McMullen, of the Chicago & Alton states that the Western roads will lose \$500,000 by the cut of the Atchison on Denver passenger rates. This is a remarkable exhibit of the tom-fool American way of running railroads, and it ought to awaken the proprietors to a sense of their interest and their duty in the premises. Such trifling with other people's money should be stopped quickly. The Atchison people are supposed to be honest, and Mr. Magoun has the reputation of being a shrewd business man. What right has he to allow his subordinates to throw traffic profits away and cause a heavy loss to the people with whose interests he has been intrusted? The system is a vicious one which allows such disastrous possibilities. If it is true, as the Atchison officials said yesterday, that they would make a profit on the cut rate, it is no excuse, but is rather an aggravation of the offense, as it measures the loss more accurately. The day is not far distant when cutting rates will not be countenanced by officials with the reputation of the Atchison Company.

But how is the "tom-foolery" to be stopped? Let us look at a few other facts. Here are six railroads extending across the plains, all hungry for passenger business. The profit on a very few passengers, even at low rates, would be very large because the haul is so long. Any one road could take half of the crowd, if not all of it, provided it could borrow cars in the East, which, as they are sleeping cars, it doubtless could. Who would not take all the business procurable, even at a small profit? And if the commission paid on the tickets was not too large, the \$12 rate probably covered considerably more than cost. We cannot make a close estimate, as the mileage on sleeping cars, the cost of hauling dining cars, and the interruption of freight are unknown quantities, but a rough computation is enlightening. An eight-car train of sleepers will carry 250 passengers, and these will pay \$1,500 for 1,000 miles. This is \$1.50 for each train mile, whereas the average income per passenger train mile in that territory is less than a dollar, and the cost per train mile, averaged for a year, is estimated at a good deal less than a dollar. The actual cost for these particular trains may be still lower as there are few or no empty cars to haul back. We deplore such an unreasonable reduction of rates, but it is only the legitimate result of building six railroads to do the work of one or two. A pool is the most rational method of regulating competition under these trying conditions, but a big cluster of plums, like the Knights Templar excursion, would be just the thing to tempt ambitious traffic managers, and presidents as well, to break a pool. Presidents do not always disapprove of rate cutting so severely as our correspondent assumes.

Engine Tires and Axles—Some of the Lessons of a Fight.

The report of the commission appointed by the government of New South Wales to investigate certain charges made by a member of the legislature (a discharged railroad employé) alleging defects in the Baldwin engines recently imported has just been issued. The charges stated that the engines were defective, were not suitable for the permanent way, and were not doing the work expected of them. The Railway Commissioners who ordered the engines, and Mr. D. H. Neale, who acted as their professional adviser in the matter, were accused of having acted improperly in ordering the engines, especially as regards certain modifications made in the specification submitted by the Baldwin Works. The report of the board or royal commission which conducted the inquiry entirely exonerates the Railway Commissioners and their officers, considers their conduct judicious, and states that the Baldwin locomotives recently supplied to that colony are not defective in design, are more suitable for the permanent way than English engines, and that they will do the work expected of them when the tires and axles have been replaced by others of less brittle character.

Probably no impartial tribunal could have come to any other conclusion, for the testimony, of which we have already published a good deal, showed that the engines were hauling trains that formerly required two English engines, while their greater flexibility and ease in riding showed that the damage to the track was reduced to a minimum.

The defective character of the truck axles was admitted, as, after heating, three broke soon after the engines arrived in the colony, while no defect was alleged against the tires until some five tender tires failed during the progress of the inquiry. As, however, the Baldwin Works appears to have promptly responded to the request to replace the defective tires and axles, it is difficult to see why the Railway Commissioners or the Baldwin Works should be blamed for defects which both endeavored to rectify promptly.

The axles which failed were made of scrap iron. The driving axles, also of iron, did not fail in service, but when tested with a falling weight, stood two blows of 2,240 lbs., falling 30 ft., and failed at a third blow with 28 ft. fall. This was not considered a sufficiently good result, and it is rather humiliating to find in the report that the axles and tires on all the engines in question are condemned as "objectionable" and should be "replaced by others of approved quality." Several of the tender tires have failed in service, and the report states that "tests show that the steel of the tires is too hard and brittle and very liable to fracture." It also states that "some 12 or 15 wheels have worked loose on their axles." The report concludes by recommending "that the 12 passenger engines be supplied with new axles and tires of suitable quality before they are restored to passenger service."

It is very evident that some exceptional cause must have been at work to produce results so unusual in

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The tariffs show that the rates from the key points—

The Chicago & Northwestern has been collecting for some years past much valuable information and data regarding boiler waters found along its lines. In order to conduct the tests methodically and keep the record regarding these waters, the testing departments have gotten out a blank which is to be filled out by the person who collects the samples. This blank form is of four pages, letter size, for convenience in filing, and has on its first page directions for the collection of samples, and on the second and third pages a list of instructions for giving information concerning the sample of water. When this part of the blank is filled out as it should be, a complete and concise history of each sample of water is obtained. On the last or fourth page of the blank is a printed form on which is given the total solid matter obtained in the solution, derived by chemical analysis. The solid matter is divided under two headings, "A" incrusting solids and "B" non-incrusting solids. For convenience and as a standard for reference, Lake Michigan water is quoted, so that the water tested can be readily compared with that as a standard. A short opinion regarding the value of the water for boiler use is added by the chemist. Some of the questions which the persons collecting the samples are required to answer are: The source of supply; the quantity of supply during the year; whether there is any chance for the pollution of the water from coal mines, sewers, etc., that will tend to deteriorate the water for boiler purposes, and what trouble, if any, the water gives when used by engines. As each water is analyzed three copies of the blank

form are filled out, the original being kept in the laboratory, one copy sent to the General Manager and the other two copies sent to the division heads of the operating and mechanical departments. When all the waters on a division are analyzed these blanks are collected and bound together in a volume and an index made of them showing generally the value of the water as compared with Lake Michigan as a standard, and the number of engines that must use this water. By this method of keeping a record of the various boiler waters each Division Superintendent or Master Mechanic has at hand a full and complete history of all waters that are used on his division.

The long continued negotiations between Assistant General Manager Dickinson, of the Union Pacific, and a committee of the telegraph operators of the road, were ended on Saturday last by the company acceding to the demands of the operators. The reports state that the original proposition of the operators was for an increase of pay which would aggregate about \$200,000 a year on the whole road; this was finally reduced to one quarter that sum, but even this increase was refused by Mr. Dickinson, who insisted that the company could not afford to increase its expenses in that department at all. On further urgency by the operators, however, he referred the matter to the President, who was in Idaho, but no satisfaction was got from that quarter. The operators then demanded that the case go to the Executive Board in Boston, accompanying the demand with a pretty definite threat to strike if the advance was not granted. The Executive Board, however, at once decided to leave the decision with President Clark, and he in turn referred it to Mr. Dickinson, who quickly gave the operators what they wanted. It is said that the number of operators on the road is about 1,000. The operators' committee seems to have been headed by Mr. Ramsey, Chief of the Order of Railway Telegraphers. It is said that this committee of operators has been in Omaha for over two months, a fact which illustrates the grave and delicate character of an affair of this kind and which should afford a warning to all railroad employes who think that wages questions involving large sums in the company's annual estimates can be settled off-hand by the first officer they apply to. The Union Pacific men do not tell what pay they get, or want to get, and they do not say much about the nature of their negotiations, but it is fair to assume from their evident patience and deliberation, and from their complimentary remarks about Mr. Dickinson, that they insisted only on moderate claims. Another plain lesson from this case is the importance of selecting for committeemen only those known to be of solid character. A two months' discussion is a severe test, and weak leaders or mere agitators will fail under it.

The United States Post Office Department has, during the past week, transported \$20,000,000 in gold coin from San Francisco to New York in a single shipment, which came on a special fast mail train over the Southern Pacific, the Union Pacific, the Chicago, Burlington & Quincy, the Lake Shore & Michigan Southern and the New York Central & Hudson River. This money was transferred for the Treasury Department from the Sub-Treasury in San Francisco to the Sub-Treasury in New York, and the Post Office Department handled the packages under the regulations governing registered letters. The train consisted of four express cars, carrying about 10 tons each, and one passenger car. Each of the four cars was in charge of a division superintendent of the Railway Mail Service with nine assistants, all heavily armed, and the same men accompanied the train throughout. The time through was 4 days, 13 hours and 16 minutes. The train was scheduled as the second section of the regular fast mail, leaving San Francisco at 6.30 on the evening of Aug. 4. It lost some time, but this was made up during the latter part of the journey, the run from Buffalo to New York being made in 9 hours and 26 minutes, which is about the same time as that made by the east-bound Empire State Express. The train arrived in New York at 10:46 on the morning of Aug. 9, and the guards, though vigilant, did not manifest such excessive caution as to justify the sensational accounts of some of the Western reporters. The gold was in boxes of \$40,000 each, weighing about 160 lbs., and 125 of them were loaded in a car. A number of guards rode in the car next behind the engine and kept their eyes constantly on the cab and its occupants. From San Francisco to Ogden the guards (there were over fifty in all) ate in the cars, but for the remainder of the journey they went out at meal time, half of them at a time. Probably the greatest danger to which this train was subject was the possibility of a derailment, accidental or otherwise, which might injure a majority of the guards; but it appears that this was not regarded as a serious matter, as the train traveled at high speed both night and day.

NEW PUBLICATIONS.

The Railroad Engineer's Practice. Fourth Edition; Revised and Enlarged. By Thomas M. Cleemann, A. M., C. E. New York: D. Van Nostrand Co., 1892. The first edition of this little book was published about 12 years ago. The aim of the author was apparently not to advance any original or epoch-making theories, but to compile, in a compact, workable shape, some of the

knowledge which he had acquired in considerable practical experience and wide reading. He made therefore an elementary book, bringing together rules and formulae and examples of their application from many different sources. The book as now republished is, we believe, the basis of the course of lectures on practical railroad work which the author will deliver at the Rensselaer Polytechnic Institute. We venture to say, however, that after a year or two of that experience, measuring his writings by a student's needs, he will modify his book considerably.

The first part of it treats of surveys—preliminary and location—and this part contains much matter of great use to a young engineer. The same is true in greater or less degree of the short chapter on construction and the chapters on culverts, tunnels and other structures.

The chief criticism that we have to make is of the chapter on bridges. This fills 64 pages out of the total 190 pages in the book, or over one-third of the whole volume. Our criticism is that the whole chapter might have been reduced to 10 pages with profit to the reader. That is, the analyses of trusses, the discussion of the most economical height and style of bridge trusses, and nearly all the mathematics of bridges might better have been omitted, for these subjects are of little use to an engineer unless they are treated completely, which cannot be done in the space that Mr. Cleemann has given to them, and they are treated very completely in various special works. If he had pointed out the most modern practice and directed the student where to get further light as to the best practice, the chapter would have been of more use, but his teachings are not even up to date. For instance, the reader is told that "for from 20 to 60-ft. plate iron bridges and for greater spans trusses are built." Now we all know that the use of plate girders is very common up to spans considerably above 60 ft. and that 80-ft. plate girders are by no means rare.

The short chapter on trestle work and that on setting out bridge spans and those on masonry foundations and pile driving are all useful, but even in these chapters the latest theories and experience have not been introduced. These are followed by a chapter on tracklaying, one on rails and other short chapters on water stations and coaling stations. An appendix gives specifications for grading and masonry of a railroad actually built.

Altogether the scheme of the little book is good and in general it has been and still is a very useful work, but we hope that the fifth edition will be very largely rewritten.

Street Railways, their Construction, Operation and Maintenance. A Practical Hand-book for Street Railway Men. By C. B. Fairchild. New York: Street Railway Publishing Co., 1892.

This is a volume of 428 pages, exclusive of advertisements, and of an index and list of illustrations, which are interleaved with the advertisements. The author explains that the book makes little pretense to literary or typographical merit, and that he is aware that if he could revise the work it would be greatly improved. However that may be, it is a book of considerable usefulness. It has a chapter devoted to each of the three great systems of street traction, electricity, cables and horses. Another chapter, of only five pages however, is on steam, air and gas motors. Other chapters treat of inclined planes, rack roads and elevated roads; of car building, construction of track, discipline, rules and accounts.

The book has the air of being a pretty hastily collected and not very well digested mass of illustrations and descriptions from the files of the *Street Railway Journal*, and it will not be of much use to any one struggling with the higher and more difficult problems of street railroad work. Its chief use (and that will be considerable) will be found in the illustrations of special parts and devices, from which the engineer will be able to get suggestions of more or less value.

The Comparative Merits of Various Systems of Car Lighting. By A. M. Wellington and Charles Whiting Baker, Editors *Engineering News*, and W. B. D. Penniman, Chemist, Baltimore & Ohio Railroad. With 77 illustrations and complete index. New York: Engineering News Publishing Co., 1892.

This volume of 303 small pages is a revised reprint of the articles on car lighting which appeared within the last year in *Engineering News*. It is a record of tests and investigations undertaken with the purpose of determining the comparative cost, and other results, of car lighting by oil lamps, compressed gas, gasoline carbureters and electricity.

These investigations are supplemented by descriptions of the various plants and apparatus, and we are informed that in matters of dispute, advance proofs were sent to the interested parties before the first publication of the articles. It is said that criticisms that were received were duly weighed, and where possible adopted. However just or unjust may be the conclusions that are arrived at by the authors of the papers here collected, the work that they have done is a valuable one, and they should have full credit for their enterprise and industry in undertaking it. A great deal of information is brought together in such a shape that hereafter the student of the subject may start from the standpoint of considerable accumulated knowledge; and he can come to a rational conclusion without having to begin with the elements of the art.

The Yale Review. A Quarterly Journal of History and Political Science. Vol. I, No. 1, May, 1892. Boston: Ginn & Co. Single numbers, 75 cents; per annum, \$3.00.

This new Review is owned by the Yale Publishing Co. and edited by Professors George F. Fisher, George B. Adams, Henry W. Farnam, Arthur T. Hadley and Dr. John C. Schwab, all of the faculty of Yale University. It is announced that it will be devoted only to the advancement of sound learning and is committed to no party or school. The first issue sets a high standard in variety and interest of subjects, in knowledge and in style. Under the title of "Comment" there are short editorial notes on the Silver Law, the Dissolution of the Standard Oil Trust and International Almsgiving. There are 12 pages of book reviews, the books noticed being chiefly works of political or social science, and the reviews being signed. The papers are German Tariff Policy, Past and Present, by Henry Villard and Henry W. Farnam; The Demarcation Line of Pope Alexander VI., by E. G. Bourne; Legal Theories of Price Regulation, by Arthur T. Hadley; Massachusetts, and the Saybrook Platform, by Williston Walker; Labor Troubles 1834 and 1837, by Evans Woollen. Professor Hadley's paper we shall reprint in full for its present interest and permanent value to the student of the theories of the control of railroad rates.

Poor's Manual of Railroads of the United States for 1892. By Henry V. Poor. New York: H. V. & H. W. Poor, 70 Wall street. Price \$5.00.

The twenty-fifth annual number of this invaluable publication has appeared. Two weeks ago we published some of the most interesting general statistics from the introduction, and it only remains to announce the actual publication of the book.

The publishers state that they have determined to issue two supplementary volumes, namely, "Poor's Directory of Railway Officials" and "Poor's Hand Book of Investment Securities." The first will give the names and addresses of the important officers of the railroads of the United States, Canada and Mexico, also of private tramways and street railroads. Of the second it is said that "it will cover the entire field of investment in the United States. It will contain full statements of the industrial enterprises in which the public secures an interest," and it is promised that the information given shall be as trustworthy as that now supplied by the Manual in reference to railroads.

Aside from these announcements we discover no new features in this issue of the Manual. One or two (perhaps more) errors have been corrected, but on the whole the face of the Manual is such as we have known it for years.

TRADE CATALOGUES.

Grading Machines.—The F. C. Austin Company, of Chicago, Ill., has published a new illustrated catalogue of its special earth moving appliances. These include the New Era grader, ditcher and wagon loader; the Austin dump wagon and the Austin reversible road machine. Besides these special machines the catalogue shows a considerable line of scrapers, plows and other road machinery. The illustrations and description of the grader are sufficient to give one a very good notion of its construction and the method of working it. It is used in railroad work, in building levee embankments and in constructing wagon roads, ditches, etc. It can be worked on side hills where the slope does not exceed 25 ft. in 100. It is claimed that the cost per yard of loading on wagons with the New Era grader is 2½ to 2¾ cents, as compared with 10 to 12 cents with shovellers, or 9 to 11 cents with a trap. Particular attention is called in this catalogue to the Austin dump wagon. The bottom of this wagon is a heavy steel pan on trunnions. The whole load can be dumped at once by pressing a short lever under the driver's foot. This releases the pan and the rear end of it being over-balanced it tips and allows the contents to slide out. The rear axle is bent to allow the drop of the end of the pan.

Contractor's Tools and Machinery.—Messrs. Thomas Carlin's Sons, of Allegheny, Pa., issue a very full and interesting catalogue of material for the use of contractors in railroad and bridge construction, mining and various other industries. The volume, which is very liberally illustrated, has 186 pages, six of which are given to an alphabetical index. Seventeen pages show hoisting engines and 40 pages stationary and portable engines of various kinds; 18 pages are given to winding drums, winches and apparatus of like nature, while 40 pages are occupied with illustrations, descriptions and prices of derricks and derrick fittings, including wire rope. Sixteen pages are taken to illustrate grinding pans for grinding and mixing cement, lime, brick-clay, etc. The headings which we have given indicate the more important divisions of the catalogue, but by no means cover the great variety of tools and machines shown.

Catalogue and Steam Users' Manual. Star Brass Manufacturing Company, Boston, Mass.

This catalogue is issued under date of Aug. 1, 1892. The instruments and devices shown in it are far too numerous to be mentioned in detail. They include steam engine and boiler fittings of almost every sort, with illustrations, descriptions and prices. About 20 pages are given to information for engineers and steam users which

seems to be a very good collection of material. The catalogue has the special merit of being small and is bound in muslin.

Belmont Iron Works, New York and Philadelphia.—The catalogue published by this company shows ornamental iron work, such as railing, fences, gates, turnstiles, etc.

Railroad Hygiene.

It is beyond a peradventure that many more valuable lives are lost annually by the disregard of ordinary sanitary precautions in our railroad trains than are killed by accidents, yet it would appear that comparatively little is being attempted to mitigate existing evils in rail transportation.

The reports of railroad companies of the thousands transported in safety and the few injured or killed by accident have a very pleasant coloring for prospective travelers, but nothing is said and perhaps little thought given to the hundreds, and perhaps thousands, who are suffering from serious disease contracted in cars.

I am not an alarmist, I quite agree with old Horace that "The death most to fear is the death we least dream of."

We see on every hand the circulars and posters describing the comfort and elegance of our solid vestibuled trains, dining cars, buffet cars, Pullman sleepers, and all that. A great deal of cold air comes in even through the double windows. The temperature of the car is very near 80° F., if not dangerously beyond that. The heavy curtains give little promise of refreshing sleep. The smoker of a vestibule is no better ventilated than the other cars of the train.

To return to the subject of ventilation and to our sleeper, which by this time has had the blankets and curtains all folded away together in congenial companionship and the pillows stowed under the cushions where we are sitting. The car is neither fresh nor well ventilated. It does have a very disagreeable odor, a regular sleeping car odor, which travelers will recognize. We take a seat in our section. Above our heads the long narrow windows are half opened and a cold, disagreeable draft is blowing directly upon us. With General Skobloff we own up to being afraid of a draft. By and by the car becomes thoroughly overheated again and we fall asleep to wake up once more entirely chilled in the body.

Stand with me any evening between 5 and 7 o'clock at any of our railroad stations and witness the throngs of overworked, nervous, tired people hurrying to their suburban homes. Let us glance through the train. Like the luxurious western vestibule it may be overheated or it may be cold, but without doubt the deadly side windows are open.

Our railroad directors may be very intelligent men, but they seem to have little care of the necessity of rational ventilation or else their sanitary engineers or advisers have neglected their duty, if perchance such needed officials exist at all. We have no safe or rational system of ventilation in any railroad car I have ever seen, and certainly my experience has not been limited. A safe ventilation for cars is urgently needed. We need fresh air and plenty of it, but we must be able to obtain it without risking our lives. For the inventor who will discover a safe and practical system wealth and honor are awaiting.—*W. Thornton Parker, M. D.*

TECHNICAL.

Manufacturing and Business.

The Track & Car Supply Co., of Chicago, has been chartered, capital stock \$275,000, by Joseph Schneider, J. Elliott and Charles S. Burton.

Judge Lacombe, in the United States Circuit Court at New York, has filed an opinion allowing W. C. Lucie, the Receiver of the United States Rolling Stock Co., the right to lease the property of that company at Chicago, Urbana, Decatur and Ansonia to the United States Carrying Co., the lessee to pay interest on \$250,000 first mortgage bonds of the rolling stock company.

The Indianapolis Frog & Switch Works has been reorganized under the name of the Indianapolis Switch and Frog Co., with a capital stock of \$300,000, and the plant is to be removed to Springfield. The removal will be made as soon as the orders now on hand have been filled, and it is expected that 500 men will be working at the Springfield plant shortly. J. T. Gettigan, of Indianapolis, and General Dawes, of Cincinnati, were the principal owners of the old company. The new Board of Directors is as follows: O. F. Service, O. S. Kelly, W. S. Wilson, Springfield, O.; E. Jacoby, Charles Fairbanks, J. T. Gettigan and General Dawes.

C. F. Springer, 1023 River street, Des Moines, Ia., offers for sale a part or entire interest in an automatic coupler, M. C. B. type, controlled by him and patented June 7, 1892.

Iron and Steel.

The ordnance department at the Bethlehem Iron Co.'s plant has under contract 500 ft. of shafting to be exhibited at the World's Fair in Chicago. Work on the construction of the large hydraulic forging press is being pushed rapidly. The addition to the machine shop used for government work is nearly all under roof.

Engineer Joseph T. Richards, of the Pennsylvania Railroad, has prepared plans for a new two-story pier to be built by the Inman Steamship Co., at the foot of Vesey street, New York. The pier will require 1,500 tons of structural steel. Plans have been submitted for estimates.

The new shop of the Carpenter Steel Company, at Reading, Pa., has been completed. The main building is 90 x 300 ft. The plant includes Corliss engines of 500 and 300 h. p.; 3 annealing furnaces, 18 converting furnaces, 22 heating furnaces and 5 large double puddling furnaces. The company has large contracts from the government for Carpenter steel projectiles.

New Stations and Shops.

Thos. Thomson, of Brockville, Ont., has just been awarded the contract for building the new Canadian Pacific station at Vancouver, B. C.

Compound Locomotives in India.

Mr. E. B. Carroll, Locomotive Superintendent of the Bombay, Baroda & Central India, has altered one of his engines to a compound.

Mississippi River Improvement.

The Commission for apportioning the distribution of money for improvement of the Lower Mississippi for the next four years has sent to the Secretary of War the following recommendations: That of the \$10,000,000 placed at its disposal for the next four years, \$6,000,000 be devoted to building and strengthening levees on the Mississippi River at the rate of \$1,500,000 a year for the next four years ending with 1895; that \$4,000,000 be appropriated for channeling purposes, to be expended at the rate of \$1,000,000 a year for the next four years. The Commission which made this apportionment is composed of General Comstock, Colonel Suter and Colonel Ernst, of the Army; Major Harrod, New Orleans; Judge Taylor, of Indiana; Henry Flad, of St. Louis, and Major Whiting, of the Coast Survey.

Block Signals on the New York, New Haven & Hartford.

The New York, New Haven & Hartford has contracted with the Johnson Railroad Signal Co. for the erection of block signals on the New London division, which is 40 miles long. This division is now nearly all double track, and it has a large passenger business. There are to be 12 new towers, and the average length of the sections will be 3½ miles. All the signals will be fitted with the Sykes electric lock as made by the Johnson company, the instruments being the same kind as those recently put up in the Fourth Avenue tunnel, New York City. Each block signal will be electrically interlocked with every switch in the section which it controls, so that a clear signal cannot be given until all switches are actually set right for the main track, no matter how far from the tower they may be.

Water Purifying on the Union Pacific.

Mr. Arthur Pennell, of Kansas City, Mo., has just closed a contract with the Union Pacific to erect and operate a plant for treating the water at Bitter Creek, Wyo., and guarantees that the water shall be free from scale, corrosive matter or tendency to foam. The Bitter Creek water contains 25.05 grains of sulphate of soda and 48.00 grains of carbonate of soda per gallon. The plant is to be capable of furnishing water at the rate of 50,000 gallons each 24 hours.

Iron Shipbuilding in Maine.

Arthur Sewell & Co., Bath, Me., are preparing plans for the first iron sailing vessel ever built in Maine. She will be a four-masted vessel, registering about 3,000 tons, 300-ft. keel, 45-ft. beam and 27-ft. hold. Her masts will be of iron as well as the hull. The firm is putting its yard in condition for building iron vessels as rapidly as possible, and expects to lay the keel of the first one early in the winter.

The Panama Canal.

Paris dispatches have repeatedly in the last 10 days stated that M. Pourquill, Director of the canal, has signed a convention with a syndicate for continuing the work. The syndicate is represented by M. Hielard of the Paris Chambers of Commerce, who says that it will resume work on the canal at once, and push it with all possible speed until the canal shall be completed. The syndicate includes former contractors on the canal work.

Krupp Gun Works.

The story that the managers of the great Krupp iron works at Essen, Germany, intended starting a gun works in Russia, is mere newspaper talk. This same story appeared in the papers about a year ago, and Mr. Krupp then said there was no truth in it whatever, and that he had no intention of establishing any branch works.

The Niagara Falls Tunnel.

Resident Engineer Porter states that the power tunnel will be completed by Oct. 1, and that it is probable water will be let into it by that date. The other work is progressing rapidly. On Aug. 20 a meeting of the officers and engineers of the Cataract Construction Co. will be held at Niagara Falls. Prof. Forbes and Prof. Unwin, of London, England, will be present. The particular business to be considered is the transmission of power to Buffalo, and the development of power on the Canadian side. The contractors have 1,300 men on the pay roll, and an actual working force of 800 men, divided into two ten-hour shifts, working day and night. The wheel pit will be about 170 ft. deep from the surface of the ground to the point of discharge from the wheels. The actual water head will be about 140 ft. The canal, which is to admit the water from the river to the wheel pits, is more than 100 ft. wide, and will have a depth of 12 ft. This channel is about half excavated, and the masonry at the gates is progressing with all possible speed.

An Electric Passenger and Freight Railroad.

An important and interesting contract has recently been closed for the construction of an electric railroad which will have some novel features, and will be altogether an important departure. Not the least interesting fact about the contract is that it has been under-

taken as a whole, by H. Ward Leonard & Co., which company contracts for grading, permanent way, buildings, steam plant, electric plant, motors and cars complete. Another interesting fact is that the road will compete for passenger and freight traffic with an existing steam railroad. The enterprise in question is the Cayadutta Electric Railway, which will connect the towns of Fonda, Johnstown and Gloversville in New York, practically paralleling the Fonda, Johnstown & Gloversville Railroad. The electric railroad will have 17½ miles of track, including loops in the various towns. A complete through line will be built of heavy construction to carry 200 H. P. motors and freight trains; but portions of the line through the towns, on which passenger cars only will be run, will be of lighter construction. The tee rails to be used will weigh 45, 50 and 56 lbs. per yard. Through the streets of the towns girder rails will be used. There is one continuous grade of 3.6 per cent., 3½ miles long and one cutting containing 60,000 cu. yds. Aside from this cutting the work of construction will not be heavy. Bids for grading were closed at noon yesterday; the award is not yet announced, and indeed it is not certain that even this part of the contract will be sublet. The road will have its own passenger and freight buildings, and will be thoroughly equipped as an independent line in all respects. The scheme is to run combination cars with baggage, smoking and general passenger compartments in one car; also to run passenger trains of one motor car and two or three trailers. Although the road will be in operation by Dec. 1 it is not probable that the freight motors will be built at once. The trolley system will be used throughout for conveying the current.

Bending Rails.

Those of our readers and correspondents who have been interested in the matter of bending rails before laying them on curves, some discussions of which have recently taken place in these columns, would probably be still further interested to see the process of bending rails for the curves of the Manhattan Elevated in New York City. The standard rail of that company, as is probably well known, weighs 90 lbs. to the yard, and this has to be bent for curves of 90 ft. radius, which is a pretty heavy job of cold bending. It is done with a hydraulic rail bender made by Watson & Stillman, of New York, an illustrated description of which appeared in the *Railroad Gazette* of May 27.

Cooke Compound Locomotive.

The Cooke compound arrived in Chicago over the Pittsburgh, Fort Wayne & Chicago on Wednesday, Aug. 3. It made a fine run from Crestline to Chicago, hauling the Columbian Express, a train of fifteen heavy passenger and sleeping cars, and making up 35 minutes on the running time. For this train a double header is necessary to make running time when it is as heavy as the one just noticed. The engine is now running on the Illinois Central. It has been placed in freight service for a few days, and will then be put into passenger service. The record made by this engine on the Erie is said to be good, but no definite figures have yet been given out. The engine was built for burning soft coal, but it has done good service with hard coal without any change in grates.

Borings for the Northumberland Straits Tunnel.

The work of testing the formation through which the Prince Edward Island tunnel would have to be constructed is being carried on by the Electric Mining Co., of Ottawa. The test holes are being sunk a third of a mile apart. The depth of water in the strait varies from 60 to 160 ft., and in order to obtain a stationary surface a tripod of iron tubing with solid, pointed ends is driven into the bottom. Upon this a platform containing the apparatus is placed, the drilling being done through an iron casing sunk to the bottom. The diamond drills take out a core about an inch and a half in diameter, the boring being carried down to a depth of 110 ft. So far the formation has proved to be sandstone, with intervening strata of plastic clay. The test drilling will be finished by October.

French Locomotives.

A recent French publication gives the following data of weight and prices of locomotives in use on the railroads of that country:

SYSTEM.	Weight, kilogramme.	Price, francs.
Clapeyron.....	22,000	42,300
Crampton.....	27,500	65,000
Egerth.....	36,550	84,000
High speed.....	31,100	62,100
Suburban.....	23,950	47,800
Stephenson, six-coupled.....	21,800	48,000
Mammoth.....	22,000	46,500
Station.....	19,000	41,500
Egerth, eight-coupled.....	46,000	107,000
Heavy, eight-coupled.....	31,700	63,900
Passenger tenders.....	9,900	8,900
Freight tenders.....	9,800	9,500

The Tensile Strength of Steel Rails.

At a convention of German iron and steel manufacturers in 1889, the discussion (hard and soft rails) culminated at fixing the maximum tensile strength at about 62,000 lb. per square inch, steel rails having a tensile strength of about 60,000 lbs. being less reliable for service. Figures, however, from official sources show that from 60 to 70 per cent. of the rails used in Germany since 1880 had a tensile strength of about 75,000 lbs. per square inch, and none of these warrant any suspicion of danger. Hard rails used on the Northwestern Railroad of Austria during the severe winter of 1890-91 did not furnish a single example of fracture, and though the experience was limited, the results established perfect confidence in the

by means of a small front wheel governed by a lever. The battery is warranted to last fourteen hours without recharging.

A Houston paper states that the high bridge of the Southern Pacific over the Pecos River, in Western Texas, has been fitted with sheet iron covering. As a result, this bridge would mean serious delay, if we decided to cover every piece of wood with galvanized sheet iron. This has been done; not a square inch of wood is visible in the entire structure. The work included the covering of 2,280 ties besides a three-foot walk on the side and required 32,500 sq. ft. of sheet iron." This action was doubtless taken to prevent against the loosening of spikes or warping of rails by a fire in the floor, as the bridge itself is of metal.

London, in addition to that well-nigh consummated monument of engineering science opposite the Tower, is to have a new steel bridge, at an estimated cost of £280,000. The existing structure which spans the Thames at Vauxhall is soon to be a thing of the past. It owes its premature death—it will be but some 77 years old when it is demolished—to the inauspicious circumstances under which it was created. When the foundations were completed for what was at first intended to be a stone bridge, the builders decided to construct the remaining portion of cast iron, thus constituting Vauxhall the first metropolitan bridge built of that metal. The masonry piers were, however, left, the original design of nine narrow arches being therefore maintained. It is to the attraction engendered by the swirl of confined and eddying water under the bridge, the clamorous raucousness that the old bridge was its doom. Its foundations are reported to be in so bad a condition that the structure would, in a comparatively short period, become absolutely unsafe. The projected new bridge is, of course, to be much wider than its predecessor, which only measures 36 ft. between parapets, compared with 85 ft. of the broadest bridge in Europe, that elegant metallic framework which unites the Middlesex and Surrey shores at Westminster.—*Iron.*

The Mesaba Iron Co. has leased to the Oliver Iron & Steel Co., of Pittsburgh, a tract of its iron land, and the lessee agrees to take out a maximum of 400,000 tons each year, and will pay on this a royalty of 65 cents a ton. The company will be shipping before fall. The minimum amount of ore shipments from the Mesaba

range will, it is stated, be nearly 1,500,000 tons a year under leases already made. During July the Duluth & Iron Range road carried from the Tower and Ely mines to the docks at Two Harbors 216,703 tons of ore. The various shipping companies sent forward the following amounts: Minnesota Iron Co., 93,186 tons; Chandler, 12,016 tons; Pioneer, 1,489 tons. In June the shipments were 217,119 tons.

Cost and Price of Steel Rails.

It is more than probable that the actual cost of making steel rails at such works as those of the Carnegie Company and the Illinois Steel Company to-day does not exceed \$20 a ton. This cost, of course, is where the steel works makes its own pig iron. When rails sold at \$26 a ton and the cost of the Bessemer pig iron was \$16 a ton, the large mills were earning dividends; now the same brand of pig iron is \$14 and rails are \$30 a ton. The following comparison of prices in the United States and in England, in April, 1885, and in May, 1892, is instructive in this connection.

Pittsburgh.			
	April, 1885.	May, 1892.	Difference.
Steel rails per ton.....	\$26.00	\$30.00	+\$4.00
Bessemer pig per ton.....	17.00	14.00	- 3.00
Difference.....	\$9.00	\$16.00	+\$7.00
England.			
	April, 1885.	May, 1892.	Difference.
Steel rails per ton.....	\$23.17	\$19.44	-\$3.73
Bessemer pig per ton.....	10.09	12.15	+ 2.06
Difference.....	\$12.48	\$7.29	-\$5.19

That is, in England, notwithstanding an increase in the cost of pig iron of \$1.46 per ton, the price of steel rails decreased \$3.73 per ton, while in the United States, on the contrary, a decrease in the cost of pig iron of \$3 per ton, the price of steel rails advanced \$4 per ton. The difference in price between steel rails and pig iron decreased \$5.19 per ton in England, and increased \$7 per ton in the United States.—*Engineering and Mining Journal.*

Railroad Money.

In the Austrian *Eisenbahn-Zeitung* of June 26, 1892, appears an interesting article, with illustrations, on railroad money. Two of the illustrations represent paper dollars issued by two German railroads, the Leipzig-Dresden road and the Anhalt-Cöthen-Bernburg road, the former having issued such bills at the time of building the road in 1853 to the amount of \$500,000 for general circulation. The bills were good for their face value at all the offices of the company, and some of them have been presented for redemption at recent periods, so that it is not at all unlikely that there are some still in circulation. The bills of the latter road were issued in 1846 and 1850 and are similar in appearance to those of the former. Both are probably the only ones of their kind in existence, excepting possibly some Peruvian railroad paper money, said to have been issued not so very long ago. Besides these two engravings, our contemporary presents illustrations of a number of metal coins issued by various railroads, presumably with the view of meeting the popular demand for money in small denominations. There are, in all, 38 illustrations, showing coins with various designs, some with simple inscriptions and numbers to designate their values, others with impressions of somewhat primitive locomotives and cars, and others again with curious emblems, coats-of-arms, etc.

The Berlier Underground Railroad System in France.

Of the proposed Berlier underground system, designed to relieve the congested traffic conditions of the Montmartre district of Paris, the *Annales des Travaux Publics* gives the following new particulars: M. Berlier proposes to put down a cast-iron tube about 16½ in. diameter and 1 in. thick, the distance below the surface to be 3.28 ft. This tube tunnel is to be lighted electrically, and is to accommodate two tracks, on which trains are to be run at one minute intervals at a speed of 20 kilometers about 12½ miles per hour. Cable-towage is to be employed, that is to say, the cable will be fixed, and each car or train of cars will be fitted with an electric motor working a drum, the latter engaging the cable and thus affording propulsion. The line will be comparatively short—about 1,650 ft. from end to end—with six stations, and will have a heavy grade all one way, so that, as regards ventilation, it will, according to our contemporary, act on the principle of a gigantic chimney and have an abundant supply of fresh air. The tunnel shield system of construction is to be followed in building the road. The project has been considered favorably by the municipal authorities of Paris, and is now being examined into more in detail by a special committee appointed for the purpose. Upon the receipt of the report of this committee final action in the matter will be taken.

Rails for New South Wales.

The New South Wales Government has decided to call for tenders of 175,000 tons of steel rails, to be manufactured within the colony from material obtained within the colony. This method of procedure will, it is hoped, induce some of the English or Scotch iron masters to develop the iron mines of New South Wales and to manufacture locally. We believe the same effort has been made several times before with no success.

New Oil Pipe Line to Tidewater.

Contracts have been made for building a new pipe line independent of the Standard Oil Co., from the petroleum fields in McKean Co., Pa., to tidewater at Newburgh, N. Y., on the Hudson River. The new line will be built through the northern counties of Pennsylvania to Hancock, N. Y., and thence along the right of way of the New York, Ontario & Western railroad to Newburgh. The new line will consist of two four-inch pipes, one for crude and the other for refined petroleum. It will be 212 miles long, and will cost about \$1,200,000, of which \$600,000 has already been raised. The right of way has been obtained for the entire distance, and it is expected to have the line in operation by spring. It is reported that the builders of the new line are members of the Independent Producers' Protective Association, though that body is not interested in the enterprise as an organization.

LOCOMOTIVE BUILDING.

The Baldwin Locomotive Works will build five passenger engines for the Brainerd & North Minnesota road.

The Brooks Locomotive Works has the contract for building one six-wheel 30-ton mogul switching engine for the Duluth, Mississippi River & Northern road.

Last Friday a contract was awarded to the Brooks Locomotive Works by the Great Northern for building 8 six-wheel switching and 17 eight-wheeled consolidation engines.

The Clarion River road has awarded the contract to the Baldwin Locomotive Works for building one four-wheel connected double-bogie locomotive, weighing 100,000 lbs. It is to be equipped with the New York air brake. It will be delivered to Carmen Station, Pa., on the Buffalo, Rochester & Pittsburgh.

CAR BUILDING.

The Mexican International has placed an order for 600 new box cars.

The Brainerd & North Minnesota has awarded the contract for building 70 freight cars to the Michigan Car Co., of Detroit, Mich.

The Chicago, Milwaukee & St. Paul has lately received from the Barney & Smith Car Co., of Dayton, O., two vestibule sleeping and two day cars.

BRIDGE BUILDING.

Adrian, Mich.—The city has awarded to the King Bridge Co. a contract for a new bridge over Beecher street at \$1,600.

Bethlehem, Pa.—A new bridge will be built to span the Lehigh River, to connect Bethlehem and South Bethlehem.

Chicago.—The County Board is to erect a new draw-bridge over the Calumet River at Halstead street. Plans drawn by Engineer R. J. Mershon have been adopted and the Superintendent of Public Service will be instructed to advertise for bids, to be submitted by Aug. 16. The proposed bridge is to be a double span iron draw, and the estimated cost is \$10,000.

Cleveland, O.—An effort is to be made to have a high bridge or viaduct erected over Big Creek Valley, between Brooklyn and South Brooklyn. A petition is being circulated asking the General Assembly of Ohio to authorize the County Commissioners to issue bonds. The present bridge was built a few years ago and cost \$40,000.

Sealed proposals will be received at the office of the Board of Control, City Hall, until Aug. 17, 1892, for constructing and erecting the steel superstructure of the Swiss street bridge, consisting of one plate girder span about 66 ft. in length over all, over Walworth street.

Eganville, Ont.—Mr. James Morris, C. E., is preparing plans for a new bridge across the Bonnechere River.

Gatineau, Ont.—The townships of East and West Templeton have agreed to grant the sum of \$5,000 each toward the erection of a new bridge across the Gatineau River, leading into Hull, Que.

Hastings, Ont.—A new bridge will be built across the river Trent, at the Narrows.

Minneapolis, Minn.—The citizens are divided on the question of lowering the tracks of the Chicago, Milwaukee & St. Paul in South Minneapolis and the bridging of the right of way at each street crossing. It is stated on one hand that the present grade crossings are dangerous, and on the other that the proposed change of grade would prevent the company's assuring permanent track facilities to manufacturers along its line, and drive away those already located on it. All of which, it is claimed, will be detrimental to the property owners and citizens in the lower part of the city.

It is proposed to bridge the right of way of the Minneapolis & St. Louis and the Chicago, Milwaukee & St. Paul, at Lake street. The City Engineer's estimate of the cost is \$8,100.

Morrilton, Ark.—The contract will be let on Aug. 23 for the erection of an iron bridge to be built by the county across Bayou Creek, in Point Remove township.

Norristown, Pa.—An overhead iron bridge, crossing the railroad tracks, and which would cost \$100,000, is a talk of improvement. The Town Council will ask the Pennsylvania, Schuylkill Valley and Philadelphia & Reading to construct the bridge on DeKalb street, from Main street to the Schuylkill. At the direction of a special council committee, Borough Engineer Patterson has prepared plans for the structure.

Norwood, Mass.—At the meeting of the board of works this week the plans for the proposed Norwood bridge will be submitted for inspection. As soon as they are approved by the council construction on the bridge will begin, and the temporary pontoon bridge will be removed.

Richelieu, Que.—Riddell & Common, of 22 St. John street, Montreal, attorneys for the Yule Bridge Co., which owns the bridge over the rapids of the Richmond River, recently destroyed by fire, invite bids for the purchase of the franchise and of the six stone pipes containing about 1,400 cu. yds. of solid masonry in excellent order.

Richmond, Que.—The Bridge Committee of the Carleton County Council have opened tenders for the construction of an iron bridge over the Jock River at Richmond. Nine tenders were received, five for the superstructure and four for the masonry. The bridge will be 18 ft. wide, with a 5 ft. sidewalk. The tender of the Central Bridge Co., of Peterborough, for the superstructure, \$1,158, and that of M. & P. O'Leary for the masonry, \$1,198, were accepted. The Dominion Bridge Co., of Montreal, the Imperial Bridge Co., of Montreal, the Hamilton Bridge Co., and the J. & C. Browne Co., of Belleville, Ont., were the other bidders for the superstructure.

Roanoke, Va.—The Roanoke Development Co. has let a contract for the construction of the iron bridge over the Roanoke River at West End Furnace.

Rumford Falls, Me.—The contract for the iron work for the highway bridge at Rumford Falls has been awarded to Dean & Westbrook, of New York, for \$7,850.

Sioux City, Ia.—The council has let the contracts for building the Leech street and Seventh street combination bridges. The Seventh street bridge will be built by A. Y. Bayne & Co. for \$2,600; it is to be 16 ft. wide. The Leech street bridge, 24 ft. wide, will be built by George Adgate for \$3,800.

Wheeling, W. Va.—Sealed proposals will be received at the county engineer's until Aug. 16 for the construction of two abutments and one pier for the Cruger Lane

Bridge over Wheeling Creek, embracing 420 cu. yds. of masonry and 100 cu. yds. of excavation in foundation. W. M. Smith, County Engineer.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Central of Ohio, semi-annual, 3 per cent. on the preferred and common stock, payable July 30.

Connecticut & Passumpsic, semi-annual, 2½ per cent., payable Aug. 1.

Elgin & Pere Marquette, semi-annual, 2 per cent. on the preferred stock, payable Aug. 15.

Mahoning Coal Ry. Co., semi-annual, 3 per cent., on the common stock, payable Aug. 1.

Maine Central, semi-annual, \$5 per share, payable Aug. 15.

Massachusetts Valley, semi-annual, 2½ per cent., payable Aug. 1.

Mexican Northern, quarterly, 1½ per cent., payable Aug. 16.

Pemigewasset Valley, semi-annual, 3 per cent., payable Aug. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Boston, Hoosac Tunnel & Western, annual, Saratoga Springs, N. Y., Aug. 17, for the election of directors and to consider the consolidation with the Fitchburg.

Chicago, Milwaukee & St. Paul, annual, Milwaukee, Wis., Sept. 21.

Chicago & West Michigan, special, Grand Rapids, Mich., Aug. 16, to authorize the purchase of the Chicago & North Michigan.

Upper Coos, Lancaster, N. H., Aug. 16.

Troy, Saratoga & Northern, annual, Saratoga Springs, N. Y., Aug. 17.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The New England Railroad Club holds regular meetings at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The Western Railway Club holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The New York Railroad Club holds regular meetings on the third Thursday in each month, at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y. The next meeting will be Sept. 15.

The Central Railway Club meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The Northwest Railroad Club meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The Northwestern Track and Bridge Association meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The American Society of Civil Engineers holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The Boston Society of Civil Engineers holds its regular meetings at the American House, Boston, at 7:30 p. m., on the third Wednesday in each month.

The Western Society of Engineers holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The Engineers' Club of St. Louis holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The Engineers' Club of Philadelphia holds regular meetings at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January. The club stands adjourned during the months of July, August and September.

The Engineers' Society of Western Pennsylvania holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The Engineers' Club of Cincinnati holds its regular meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The Civil Engineers' Club of Cleveland holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The Engineers' Club of Kansas City meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The Engineering Association of the South holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The Denver Society of Civil Engineers and Architects holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The Civil Engineers' Society of St. Paul meets at St. Paul, Minn., on the first Monday in each month.

The Montana Society of Civil Engineers meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The Civil Engineers' Association of Kansas holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The American Society of Swedish Engineers holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The Engineers' Club of Minneapolis meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The Canadian Society of Civil Engineers holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The Association of Civil Engineers of Dallas meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The Technical Society of the Pacific Coast holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o'clock p. m. on the first Friday of each month.

The Tacoma Society of Civil Engineers and Architects holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The Engineers and Architects' Club of Louisville holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

The Association of Engineers of Virginia holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

American Railway Master Mechanics' Association.

The following are the committees for the year 1892-3:
Exhaust Pipes, Nozzles and Steam Passages.—C. F. Thomas, A. W. Gibbs, S. Higgins, J. M. Wallis, Geo. W. Smith, Robert Quayle, John Y. Smith.

Standard Tests for Locomotives.—To investigate the practicability of establishing a standard system of tests to demonstrate the fuel and water consumption of locomotive. Also to ascertain the value of the steam engine indicated in locomotive tests. J. N. Lauder, W. J. Robertson, Albert Griggs, John D. Campbell, F. W. Dean.

Compound Locomotives.—To investigate the relative economy of compound and simple locomotives; also the most valuable form of compound locomotive. George Gibbs, William H. Lewis, Pulaski Leeds, James Meehan, T. W. Gentry, A. T. Woods.

Auxiliary Committees.—S. M. Vanclein, Baldwin Locomotive Works; Reuben Wells, Rogers Locomotive Works; H. N. Sprague, Porter Locomotive Works; A. J. Pitkin, Schenectady Locomotive Works; Joseph Lythgoe, Rhode Island Locomotive Works; F. J. Leigh, Canadian Locomotive Works; D. A. Wightman, Pittsburgh Locomotive Works; H. Tandy, Brooks Locomotive Works.

Tests of Steel and Iron.—To test the critical temperature of steel and iron; also, any other questions relating to steel and iron that the committee may consider of value.—William Smith, J. N. Barr, A. W. Quackenbush, P. H. Peck, D. L. Barnes.

Uniform Locomotive Performance Sheets.—To report on the practicability of establishing a system for recording the performance of locomotives that will fairly represent the work done. George F. Wilson, J. S. McCrum, John Player, James McNaughton, John A. Hill.

Standard Diameters for Wheel Centres and Tires.—To report on dimensions of wheel centres for driving wheels larger than the standard; also to investigate the means of securing uniformity in rolled outline of standard tires. A. E. Mitchell, W. C. Ennis, Thomas Miller, C. A. Thompson, L. H. Pomeroy.

Boiler Attachments.—How can the safety of these be increased and how can the number of holes in boiler be lessened? James Macbeth, A. Dolbeer, J. M. Boon, W. A. Foster, M. N. Forney.

Malleable Iron Castings.—To what extent can these be used to take the place of expensive forgings? R. H. Soule, W. Garstang, W. H. Thomas, C. H. Cory, W. D. Grossman.

Attachments Between Engine and Tender.—Suggest improved form that will prevent the tendency for the tender to mount the footplate; also to report on footplate and hand-rails. J. Davis Barnett, G. W. Stevens, C. E. Smart, W. S. Morris, L. S. Randolph, L. F. Lyne.

Smoke Prevention.—Recommend methods of smoke prevention that will satisfy municipal requirements in cities. J. N. Barr, F. Mertschmer, P. W. Gentry, Wm. McIntosh, W. H. Marshall.

Tender Frames.—Reports on best form of tender and truck frames of wood and iron. R. C. Hackall, E. E. Davis, John Mackenzie, T. Purves, Jr., F. B. Miles.

Outgoing Notices.—Subject and Committee: Ross Keils; Leroy Keils; Wm. F. Turrell; Wm. Fuller; Joseph Bradt, A. Dolbeer; S. D. Bradley, J. E. Keegan; Edward Nichols, M. L. Hinman; Wm. Smith, E. E. Davis; Wm. Wilson, A. Quackenbush; O. A. Haynes, H. Elliot; James Sedgley, G. A. Stevens.

On Applications for Associate Members.—George H. Baker; Committee: J. N. Lauder, Wm. Swanson, R. H. Briggs, John H. Lewis, J. D. Campbell, F. M. Trenchard, H. F. Robinson; J. N. Barr, G. F. Wilson, Peter H. Peck.

On Subjects for Investigation.—George Gibbs, William Smith, E. M. Roberts.

Delegates to American Society of Railroad Superintendents' Convention.—J. N. Lauder, John Mackenzie, Executive Committee.—John Higley, R. C. Blackall, William Garstang, O. Stewart, Angus Sinclair.

Master Car and Locomotive Painters' Association.

The twenty-third annual convention of this Association will be held in Detroit, Mich., convening at 10 o'clock a. m., Sept. 14. Two sessions will be held each day, continuing for three days, or until the business of the convention is fully disposed of. The Russell House has been selected as the headquarters of the Association, where special arrangements have been made for delegates, and the uniform rate of \$3 a day for board and rooms have been secured for all in attendance at the convention. Those desiring to engage rooms previous to the Convention will address Chittenden & McCreary, proprietors of the Russell House. Foremen, car and locomotive painters throughout the United States and Canada are cordially invited to attend the Convention. Committees are appointed who will be fully prepared to report on the several questions assigned them, and these reports, when given, will leave the subject open for general discussion.

The annexed list of subjects has been chosen by the Advisory Board:

1. Would it be practicable for railroad companies to adopt the piece price system in the paint department upon all roads? If so, what plan and schedule would you suggest for doing the work so as to cover all classes and parts of paint shop work upon locomotives and cars? E. L. Bigelow, Baltimore & Ohio R. R., Baltimore, Md.; Jno. P. Stroud, Allegheny Valley R. R., Verona, Pa.; and J. W. Houser, Cumberland Valley R. R., Chambersburg, Pa.

2. What is the best method of making putty for passenger car work, speed and durability combined? Is it advisable to use any coloring with lead in mixing hard drying putty? J. H. Hannon, Lehigh Valley R. R., Delano, Pa.; B. F. Murphy, Wilmington & Weldon R. R., Wilmington, N. C.; and Wm. Cloonan, Lewis & Fowler Mfg. Co., Brooklyn, N. Y.

3. In what manner should the outside surface of a passenger car be treated that has a good foundation, but requires recoloring? Should the varnish be removed before recoloring? If so, how? J. H. Stout, Baltimore & Ohio R. R., Grafton, W. Va.; H. J. Taylor, Pittsburgh & Western R. R., Allegheny, Pa.; and Robert Shore, Lake Shore & Michigan Southern R. R., Cleveland, O.

4. What can be done by the members of this Association to make it of greater benefit to Master Painters and to the companies they represent? Paper by James A. Goshen, Chesapeake & Ohio R. R., Huntington, W. Va.

5. The advantages, if any, which might accrue to the members of the Association by the appointment of a standing arbitration committee. A. J. Bruning, Louisville & Nashville R. R., Evansville, Ind.; A. J. Bishop, C. C. & St. Louis Railway, Delaware, O.; and Eugene Laing, Northern Central R. R., Elmira, N. Y.

6. Requisitions for material in the railway paint shop. In what manner should they be made to best subserve the interests of the management, economy and suitable material being the main consideration? W. J. Orr, Buffalo, Rochester & Pittsburgh R. R., Rochester, N. Y.; T. M. Dunlap, Baltimore & Ohio R. R., Pittsburgh, Pa.; and Warner Bailey, Concord R. R., Concord, N. H.

7. Which are the most durable, light or dark colors on passenger car bodies? Which is the least expensive to maintain, yellow, Pullman color or Tuscan red? Thos. Byrne, Chesapeake & Ohio R. R., Richmond, Va.; Jno. A. Putz, Wisconsin Central R. R., Stevens' Point, Wis.; and C. M. Lang, Old Colony R. R., Boston.

8. By our experience as master painters we are satisfied that passenger cars are receiving proper care at terminals? What plan and material can we recommend to improve upon the general appearance of the equipment while in service and also increase its durability? W. T. Leopold, Central R. R. of Georgia, Savannah, Ga.; J. E. Blocksidge, Delaware & Hudson Canal and R. R. Co., Carbondale, Pa.; and Wm. O. Quest, Pittsburgh & Lake Erie R. R., Pittsburgh.

9. What is the difference in cost of painting a passenger coach with yellow, Pullman color or Tuscan red? Louis Fox, New York Central & Hudson River R. R., W. Albany, N. Y.; and J. G. Keil, Chicago, Alton & St. Louis R. R., Bloomington, Ill.

Queries.—1. Do you paint your engine frames with color and then varnish them, or do you use asphaltum?

2. How do you clean the paint and varnish from glass?

3. In touching up and revarnishing a coach, is it economy to thoroughly clean and touch up the deck and trucks, or to paint them over?

4. How do you use gold and copper bronze for seat arms, heater pipes, etc., dry or mixed?

5. Which is the best gilding size, slow or quick?

6. In cutting in a coach with color, do you use it mixed in the same way as when giving a general painting?

7. Do you give the sash the last coat of varnish before or after they are put in?

8. Has any member ever found a paint remover that he felt sure would not injure the wood or subsequent painting?

James A. Goshen is President and Robert McKeon, of Kent, O., Secretary of the Association.

Technical Society of the Pacific Coast.

A regular meeting was held on Aug. 5, at 8 p. m., in the rooms of the Society, 819 Market street, Academy of Sciences Building, San Francisco. Mr. John B. Pitchford, Mechanical Engineer, read a paper entitled: "Corlias Engines." Two other papers were presented, viz: "Efficiency of Hydraulic Passenger Elevators," by Prof. Horace B. Gale, and "Remarks on the General Circulation of the Atmosphere," by Lieut. John B. Finley.

The Southern and Southwestern Railway Club.

The next meeting of the Club will take place at the Kimball House, Atlanta, Ga., on Aug. 18, at 10 a. m. The subjects for discussion will be:

(1) Joint inspection.

(2) Charges for wrong material in freight car repairs.

(3) Locomotive cylinders, the effect of wear from packing, best style of packing ring where economy of first cost is considered. The experience of those using 18-in. cylinder or over is especially desired. The following committees are expected to make reports: On repair work on large systems and locations of plants for same: W. H. Thomas and Pulaski Leeds, Committee.

On the most suitable form of performance sheet for general use: Pulaski Leeds, A. W. Gibbs and William Garstang, Committee.

PERSONAL.

—Mr. E. J. Foster, Assistant General Freight Agent of the Chicago & Northwestern, at Winona, Minn., has resigned.

—Mr. H. F. Ernest, who has been connected with the Pullman Car Co., in Atlanta for many years as assistant superintendent, has resigned to engage in other business.

—Mr. James C. Clarke, President of the Mobile & Ohio, is spending August in Denver with his family; he is the guest of President E. T. Jeffery, of the Denver & Rio Grande, whose wife is a daughter of Mr. Clarke.

—Mr. J. O. Pattee, who has for the past four years been Master Mechanic of the Great Northern, has been appointed Superintendent of Motive Power of the Great Northern, Montana Central and proprietary companies.

—Mr. George Taylor, General Freight Agent, and Mr. Arthur S. Busby, General Passenger and Ticket Agent of the Intercolonial, have been retired. The superannuation of these officers by the new Minister of Railways has been anticipated for some time.

—Mr. Charles C. Morrison, formerly President of the Columbia Bridge Co., of Dayton, O., has recently opened an office at 114 State street, Milwaukee, Wis., as consulting bridge engineer and contracting agent for the Lafayette Bridge Co., of Lafayette, Ind.

—Mr. Theodore Sturgess, well known in the iron trade, died suddenly in Brooklyn last week, in his 63d year. He was President of the Oxford Iron & Nail Co., Treasurer of the Lackawanna Iron & Steel Co., and a director and officer in half a dozen other corporations in the same business.

—Mr. Henry C. Gould has been elected Vice-President and General Manager of the Gould Coupler Co., and Mr. F. P. Huntley, for many years employed in a confidential capacity by Mr. Chas. A. Gould, in his various manufacturing enterprises, has been elected Secretary of the Gould Coupler Co.

—Mr. John Kruttschnitt, the aged father of Julius Kruttschnitt, General Manager of the Atlantic system of the Southern Pacific, and of E. B. Kruttschnitt, the well known railroad lawyer, died last week. He was a man of considerable intellectual attainments and was an engineer of recognized ability.

ELECTIONS AND APPOINTMENTS.

Altamont & Manchester.—The following is a list of officers: C. Crooke, President; F. E. Sampson, Secretary, and A. M. Crooke, Treasurer; all with office at Altamont, Ky.

Atchison, Topeka & Santa Fe.—The office of the General Roadmaster on the Chicago division has been abolished. F. G. Ewald, Resident Engineer, will assume direct charge of the maintenance of track, bridges, buildings and water service.

Canadian Pacific.—George McL. Brown has been appointed District Passenger Agent, with headquarters at Vancouver, B. C.

Cincinnati, Hamilton & Dayton.—D. H. Roche has been appointed Division Freight Agent in charge of the coal and other traffic of the Cincinnati, Dayton & Iron-ton division, with office at Dayton, O.

C. G. Waldo, Purchasing Agent, has been appointed assistant to President Woodford. He will be succeeded by George R. Balch.

Cleveland & Mahoning Valley.—The annual meeting was held at Cleveland, O., last week and resulted in the re-election of the former directors, Stevenson Burke, Amos Townsend and Charles G. Hickox for three years. The directors elected the old officers, Judge Stevenson Burke, President; E. R. Perkins, Treasurer; E. E. Poppleton, Secretary, and J. E. Ingersoll, E. R. Perkins and C. G. Hickox, Executive Committee.

Cleveland, Lorain & Wheeling.—P. Bruner, of Pittsburgh, Trainmaster of the Pittsburgh division of the Baltimore & Ohio, has been appointed Superintendent of this road to fill the vacancy created by the resignation a few months since of Frank M. Townsend.

Cobourg, Northumberland & Pacific.—R. Muirholland is President of this road, and G. Guillett, M. P.; E. Cochran, M. P.; Dr. Richards, Workworth; W. W. Armstrong, Campbell, Ont., and T. B. Carlow, Percy, are Directors. The principal office is at Cobourg, Ont.

Duluth—Messabe & Northern.—George H. White has been appointed Superintendent. Appointment takes effect Aug. 15.

Duluth, Mississippi River & Northern.—The officers of this company are: President, C. W. Wells; Vice-President, F. C. Stone; Secretary, W. T. Knowlton; Treasurer, C. H. Davis, all of Saginaw, Mich.; Superintendent, J. F. Killorin, and Chief Engineer, W. A. Dafter, both of Swan River, Minn.

Fort Plain & Richfield Springs.—The directors are: William Clark, John D. Vendell, W. E. Diefendorf, David G. Hackney and Edwin S. Van Deusen, of Fort Plain, N. Y.; S. R. Stewart, of Springfield Centre, N. Y., and Norman Getman, E. B. Weatherbee, Myron A. McKee, of Richfield Springs, N. Y.

Georgia, Carolina & Northern Belt.—This company has been organized, with J. H. Winder, President; R. C. Hoffman, Vice-President, and Haskell Thomas, Secretary, to build the belt road at Atlanta, Ga.

Great Northern.—H. A. Johnson has been appointed Northern Freight Agent with headquarters at Spokane, Wash.

Green Bay, St. Paul & Minneapolis.—The incorporators are Joseph Walter, Jr., of Champion, Wis., and W. J. Abram and F. B. Seymour, of Green Bay, Wis.

Guilty's & Paint Rock Valley.—W. H. Calhoun, who has had charge of the location and construction of the Guilty's & Paint Rock Valley road, has been appointed Chief Engineer and Superintendent of Construction to succeed S. I. Wheatcroft, resigned. His headquarters will be at Guilty's, Ala.

Illinois Central.—F. B. Harriman has been appointed Superintendent of the Fremont division, and L. W. Albright, formerly Chief Train Dispatcher of that division, has been appointed Trainmaster.

Illinois Southwestern.—The incorporators are R. A. Wade, D. R. McEntee, D. M. Still, Wesley Briggs and Charles E. Wyman, all of Chicago.

Illinois & Western.—The incorporators are: Glenn W. Tracer, Charles E. Phelps, George F. Bartlett, Sanford A. Burham and Charles R. Salberg, of Chicago.

International & Great Northern.—H. B. Kane has been appointed General Claim Agent with headquarters at Palestine, Tex., vice T. N. Jones, resigned.

Langhorne & Bristol.—The following are the directors of this new company: A. A. McLeod, President, and D. Jones, Howard T. Naisby, Jas. M. Landis, Roswell Weston, Wm. B. Scott and C. J. McDougal, all of Philadelphia.

Macon & Northern.—J. F. Hanson, of Macon, Ga., has been appointed Joint Receiver with Jephtha Rucker, by order of Judge Newman, who had made the previous appointment of Mr. Rucker. Both receivers are members of the joint board operating the road; one represents the Richmond & Danville interest and the other the Central of Georgia.

Newport News & Mississippi Valley Co.—On Sept. 1 the joint traffic offices of this company and the Louisville, New Orleans & Texas will be abolished. L. F. Day, Traffic Manager of both roads, will resume the duties of Traffic Manager of the above company, with offices at Louisville, and M. B. Cutter, now General Superintendent of both roads, will resume his former position as General Superintendent of the Newport News & Mississippi Valley.

New York, New Haven & Hartford.—R. G. Curtis, for some time Acting Superintendent, is now Superintendent of the Northampton division, with headquarters at New Haven, Conn. J. L. Woodruff has been appointed Assistant Superintendent of the division, with office at Westfield, Mass.

Philadelphia, Reading & New England.—J. T. Dermithorn, of Phoenixville, Pa., lately connected with the Philadelphia & Reading engineer corps at Pinegrove, Pa., has been appointed Engineer of the New England Division, with headquarters at Hartford, Conn. C. P. Wilson has been appointed Trainmaster.

Pittsburgh, Akron & Western.—General Superintendent C. W. Risley has, on account of ill health, been granted leave of absence from Aug. 15 to Jan. 1. General Manager Semple has appointed John H. Sample Superintendent in addition to his duties as Chief Engineer, his headquarters being at Akron, O.

San Antonio & Aransas Pass.—W. S. Rowen has been appointed Lost Freight Agent of this company, with headquarters at San Antonio, Tex.

San Francisco & Denver.—The company has been incorporated by Thomas R. Hayes, Daniel E. Hayes, James Joyner, Charles R. Alberger and William C. Alberger.

Union Pacific.—J. P. Douglass, Jr., is the name of the new General Agent for the Fort Worth & Denver City, at New Orleans. His office is at 158 Common street, New Orleans, La.

West Virginia Central & Pittsburgh.—At the annual meeting at Cumberland, Md., Aug. 9, the following officers were elected: H. G. Davis, President; S. B. Elkins, Vice-President; Board of Directors, H. G. Davis, S. B. Elkins, James G. Blaine, W. W. Taylor, John A. Hambleton, T. B. Davis and R. C. Kears. E. W. S. Moore was elected Secretary and Treasurer.

RAILROAD CONSTRUCTION.
Incorporations, Surveys, Etc.

Adirondack & St. Lawrence.—About 25 miles of road remains to be constructed between Raynor's pond on the north, 18 miles from Childwood, N. Y., and from three miles north of the Old Forge, on the Fulton chain of lakes, on the south. Between those points the roadbed is about completed and the rails will be laid in a few weeks. A large section of the roadbed now in use was laid in frosty weather and when the ground thawed the roadbed settled under the weight of the heavy rolling stock in use on the road. These portions of the road will thus have to be rebalanced. Nearly 2,000 men are now employed in pushing forward the work on the road, which will be completed toward the last of September.

Allegheny & Lawrence.—The recent incorporation of this company has been noted. It is proposed to build a road from Bryant to Moravia, Pa., both points being on the Pittsburgh & Western, Bryant about 11 miles from Allegheny and Moravia three miles from New Castle Junction. The Pittsburgh Post states that the organization of this company is part of the preliminary arrangement for rebuilding the Pittsburgh & Western between Allegheny and New Castle. The work will involve the construction of a more direct line practically over a new route for a considerable part of the distance, and for this reason a new charter was secured. The maximum grade will be reduced from 100 ft. to 35 ft. to the mile on about six miles. Two tunnels will be built, one 2,300 ft. at Bakerstown, and another near Bryant. The new line will be about 40 miles long, double tracked, and will shorten the present route about seven miles.

Altamont & Manchester.—In addition to the news of this road printed last week, it may be said that the proposed route lies through the towns of Manchester, Hyden and Whitesburg, in the southeastern part of Kentucky. The western terminus is at Altamont, on the Louisville & Nashville, but the eastern terminus has not been decided upon as yet. The company is doing most of the work with its own men, about 50 being at work, and it has five miles graded and expects to have that much in operation by Nov. 1.

Altoona & Phillipsburg Connecting.—This road is to extend through the towns of Stearns, Mapleton, Oscoda, Decatur, Moshannon, Brimlin, Stirling, Houtdale, Loraine, Mt. Vernon, Kendrick, Ramey, Kittanning and Janeville, Pa. The surveys have been made, and the contracts will soon be let. The work will be easy, and the heaviest grade is four per cent. for a short distance. The only bridge is a 50 ft. span. This road is to connect with the Altoona, Clearfield & Southern, near Janeville, and the Beech Creek at Phillipsburg, making a direct line through the coal regions to Altoona, and will secure the tonnage of the United Collieries Co. of Philadelphia. Samuel P. Langdon, Bullitt Building, Philadelphia, is President.

Bellingham Bay & Eastern.—This road, completed in July, is a short coal and lumber road, reaching from tide water at New Whatcom, to Lake Whatcom, Wash., which latter body of water is about 12 miles long, surrounded by coal mines and an heavy timber. The company owns three miles of its track, and has trackage rights over three miles of the Fairhaven & New Whatcom road, all being standard gauge. The road is completed, and timber and coal are being hauled over it, all the traffic being from the lake to tide water on Puget Sound. Passenger trains are not run. The company has a transfer barge on the lake which carries 24 10-ton coal cars, and is in constant service. J. J. Donovan, of New Whatcom, is Chief Engineer.

Buffalo & Geneva.—A party of the officials of the Philadelphia & Reading will inspect the new extension of the Lehigh Valley to Buffalo, which is now almost ready for business, next week. No date has yet been fixed for the opening, but it will not be later than Sept. 1. The new road, which extends from Van Ettenville, N. Y., to Buffalo, has been built in the most thorough manner and double tracked. Its opening has been delayed in order to get it in excellent shape for the heavy traffic which will be carried over it from the first. On Aug. 1, 75 miles of the second track had been completed on the Buffalo & Geneva, leaving about 20 miles east of Batavia still unfinished and on the Geneva & Van Ettenville there is also about 20 miles of second track to build.

Canadian Pacific.—The government engineer is making an inspection of the Souris extension road in Montana prior to the company receiving the bonus of \$1,750 per mile voted by the Montana legislature.

In an interview at Ottawa, Saturday, President Van Horne said that the company would at once commence the building of a branch from Renfrew to Eganville, Ont., and 30 miles beyond toward Parry Sound.

It is announced that work on the extension to the United States boundary line will commence this week at Pasqua, near Moose Jaw, Assinabola. The line will be pushed through without delay. The contractors who have been awarded the work are Messrs. Strel, Keith, MacArthur, Smith and Egan Bros. The road is to connect with the extension of the Minneapolis, St. Paul & Sault Ste. Marie, which is being built north to the international boundary line.

Canadian Western.—The contract between the provisional Directors of the road and Frank Bakeman, Trustee for the Construction Company, was executed at Victoria, B. C., last week. Messrs. R. P. Rithet, T. Earle, E. G. Prior and Frank Bernard, signing the document on behalf of the company. Mr. Bakeman undertakes, on behalf of his company, to deposit with the Government a guarantee of \$50,000 for the expenditure of that sum in surveys during the first year; and to form a construction company of sufficient capital to build and equip the line. This company takes over all land and money subsidies that are given in aid of the road.

Chicago Great Western.—The daily papers throughout the Northwest are again building a line from Des Moines to Omaha for this company. President Egan, of the Chicago Great Western, and President Oppenheimer, of the Chicago, St. Paul & Kansas City, both state that they know nothing about any extensions except what they have seen in the daily papers.

Chicago, Rock Island & Texas.—The following account of the work on the southern extension is given by a contractor: Work between Red River and Bowie, Tex., 24 miles, is progressing rapidly, and at least 3,500 men are at work, including about 2,000 teams. The first few miles of road from Red River are heavy, owing to the broken condition of the ground, and numerous deep cuts are being made. The heaviest part of the work is on the first division, Captain Wear, contractor. Sheridan Bros. have the next few miles, and M. Nealy & Co. the third

division. Work is well under way on the iron bridge over Red river, and the road will be completed as far as Bowie, so far as grading is concerned, in less than 60 days. M. Nealy & Co., Creech Murphy, Craney Bros. and W. F. Callahan also have contracts.

Cobourg, Northumberland & Pacific.—Edmund Bristol, of Toronto, representing Ferris & Richards, constructing engineers of New York, has entered into a contract for the construction of this road, from Cobourg, Ont., northeast about 50 miles.

Concord & Montreal.—The extension of the Whitefield & Jefferson road from Jefferson Meadows east to Gorham and Berlin, N. H., is going forward rather slowly, and it will not be opened for travel before another year. This will open a new route to the east side of Mount Washington.

Duluth, Mesabe & Northern.—Tracklaying is progressing at the rate of two miles each day; and the officers of the company promise to deliver ore from the mines of the Mountain Iron Co., on the docks at Superior on Sept. 1.

Duluth & Northwestern Railway & Terminal Co.—Work has been begun on this company's terminals on Minnesota Point, Duluth.

Fort Plain & Richfield Springs.—This company was incorporated in New York this week with a capital of \$300,000 for constructing a road about 30 miles long, from Fort Plain to Richfield Springs, with a branch to Palatine, Montgomery County. Some work has been done under a previous charter. The present company is a local one, organized by W. Clark, of Fort Plain, N. Y., and has secured the right of way. A New York firm will probably build the road, but no agreement has yet been made.

Great Salt Lake & Hot Springs.—The engineer who is in charge of the survey now being made west of Salt Lake City writes that it is proposed to run a preliminary line to Ithapah in Tooele County, Utah, a distance of about 140 miles from Salt Lake City. The grading will be light, and the maximum grade 1½ per cent. The engineers are working west of Stockton on the old Utah Central line. S. Bamberger is President and H. S. Joseph Chief Engineer.

Green Bay, St. Paul & Minneapolis.—This company has been incorporated in Wisconsin to build a line from Alma Centre, in Jackson Co., to St. Paul and Minneapolis. There are two routes under consideration from Merrillan to St. Paul; one is 120 miles and the other 130 miles in length. The proposed route will pass through Jackson, Trempealeau, Buffalo, Pepin, Dunn, Pierce and St. Croix counties.

Illinois Southwestern.—The company filed articles of incorporation in Illinois, Aug. 9. The road is to be built from a point on the proposed Chicago & New Orleans near the line between Jefferson and Franklin counties, Ill., to some point in Jackson County, near Carbondale. The capital stock is \$1,000,000.

Malisco Pacific.—A locating party of engineers of the Mexican National Construction Co. has left Colima for Guadalajara, Mex., surveying the line between those cities. The work of building the road will be commenced as early as possible.

Kansas City, Nevada & Fort Smith.—L. J. Smith, who has the contract for building the first 20 miles south of Hume, Mo., has begun the grading. The line as located extends due south and the profile is made as far as the Osage River in Vernon County. A party of engineers is now locating the line south of the Osage. The junction with the Missouri, Kansas & Texas will probably be made at Clayton, 12 miles west of Nevada, Mo.

La Fayette & Monon.—Preliminary surveys have been made for this belt line at La Fayette, Ind., by the Belt Railway, Land & Improvement Co. The line will extend from a point on the Louisville, New Albany & Chicago round the city of La Fayette, crossing the Wabash and the Lake Erie & Western, connecting with the Cleveland, Cincinnati, Chicago & St. Louis. Adams Earl is President, W. F. Stillwell, Vice-President, and James Buck, Secretary and Treasurer.

Langhorne & Bristol.—This company was incorporated in Pennsylvania last week to build a road from a point of connection with the Delaware River Branch of the North Pennsylvania (Reading system) to Bristol, Bucks County, Pa. The road will be six miles long. The capital stock is \$500,000. The Philadelphia & Reading has for a long time been considering the advisability of constructing a line from Langhorne to Bristol.

Little Falls & Dolgeville.—Goedeffroy & How, contractors, report that the work on the cut, three miles south of Dolgeville, N. Y., will be completed in about ten days. Land slides have delayed the work. Freight shipments will be sent out of Dolgeville shortly. When the cut near Dolgeville is completed all the teams and laborers will be sent to the northern end of the line.

Lynchburg Belt.—The first mile of this road at Lynchburg, Va., is now being built, the contractor being R. J. McGran, of Pottsville, Pa. The work is quite heavy, and will not be ready for tracklaying until Sept. 15. The Belt Line is being built by the Norfolk & Western, and is to connect the track of that company with the Lynchburg & Durham.

Minnesota, St. Paul & Sault Ste. Marie.—Work on the extensions from Valley City and Merricourt, N. D., is being pushed and tracklaying has already been commenced on the Valley City line. There has been considerable delay on account of the scarcity of men, caused by the demand for harvest hands and the high wages paid for that class of work. The bridges are built and good progress is being made with the track.

Minnesota & Wisconsin.—Fifteen miles of this line, from Spring Valley to Woodville, Wis., has been completed and is now in operation. From Woodville, where the road connects with the Chicago, St. Paul, Minneapolis & Omaha, an extension 11 miles in length, to Emerald on the Wisconsin Central, is now under construction. The grading in the extension is about half finished, and the line is to be ready for operation on Oct. 1.

Missouri, Kansas & Texas.—Barkitt, Burns & Murphy, of Palestine, Tex., have about 150 teams working on the extension from Smithville west to Lockhart, and the contractors expect to complete the work on the branch in about two months.

The report that the contract had been let to the same firm for the Houston extension appears to have been erroneous; bids have been received for the grading on the branch, but the contracts for the work will not be awarded until next week.

Newport & Sherman's Valley.—The grading for the extension of the road was begun at Blain, Perry County, Pa., last week. The extension is to be built from Blain southwest to New Germantown. The ultimate terminus will be at a point in the Broad Top coal regions, about 30 miles from Blain.

Ohio Valley.—The extension to Hopkinsville, Ky., a distance of about ten miles southeast of the present terminus of the Princeton branch, was opened for traffic on Aug. 4.

Ottawa, Arnprior & Parry Sound.—Mr. C. J. Booth, President of this road, says in reference to the remarks of President Van Horne, of the Canadian Pacific, on the subject of the Parry Sound extension and the Canada Atlantic, that: "The Parry Sound road does not run parallel to the Canadian Pacific from Ottawa to Renfrew, Ont. In some places the lines diverge as much as twelve miles. In one place we cross the Canadian Pacific at right angles, and then granting the roads to be apparently parallel, there is not and there never was any intention of competition. We had to get to Parry Sound some way, and the route selected was the most convenient to ourselves."

Ottawa & Parry Sound.—The work of building this road at Carp, Ont., is advancing most favorably. Already five or six miles of the road has been graded. Work will be commenced at Arnprior, Ont., in about a month, proceeding in the direction of Carp, and the road will be running between Arnprior and Ottawa in October. The most difficult part of the construction is between Carp and Ottawa.

Philadelphia Belt Line.—The application of the company for permission to build a trestle-work along the Delaware River front from Reynolds Street to Van Kirk, Bridesburg, was discussed last week by the Port Wardens, but no definite action was taken. In answer to questions from the Board as to their right to grant the application, notwithstanding the riparian owners' objection, City Solicitor Warwick has written an opinion in favor of the plan.

Philadelphia & Bustleton.—The contractors are pushing the work on the Pennsylvania branch rapidly. The grading on the first mile north of Frankford is about completed, and a bridge is in course of erection on the next section. The surveyors have located the road to Hulmeville, Bucks County, near the upper end of the line, which it is supposed will join the New York division near Tullytown.

Philadelphia & New England.—Meetings are now being held in various towns along the Delaware River Valley, and are addressed by J. E. Bloom, of New York, and others of the projectors who ask that right of way be granted and local subscriptions to the stock made. The town of Jeffersonville has subscribed \$18,000 and White Lake \$10,000. The new route is to be from Port Jervis, N. Y., to Stroudsburg, Pa., but a new road will only be built west of Monticello. Nearly all the stockholders of the Port Jervis, Monticello & New York are reported to have agreed to an exchange of their stock for that of the new road.

Philadelphia & Reading.—Good progress is being made in the construction of the Newtown connecting road from near Logan Station to Olney, Pa., and the Frankford branch, which will run from Crescentville to Main and Unity streets, Frankford. Shields & Nolan, the contractors for the work, expect to have the two roads completed by November, when trains will be run to the Reading Terminal station. On the Frankford branch the steam shovels are making an 18 ft. cut through a ridge a short distance east of the Newtown road, and on the Newtown connecting road work is being pushed vigorously at both ends. A considerable amount of the grading has already been done, and the contractors have a large force of men at work. The Frankford branch crosses the new Bustleton branch of the Pennsylvania, and work has begun on the overhead bridge on which the Frankford branch is to cross the Pennsylvania tracks.

Philadelphia & Reading Terminal.—The track will be laid within a week, it is probable, all the way from Thirteenth and Callowhill streets into the new Terminal building at Twelfth and Market streets, Philadelphia. Construction is being pushed so as to enable the terminal contractors to deliver material at Market street.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The extension of the New Cumberland branch, recently placed under contract, is eight miles long. The new work is from New Cumberland north, along the east bank of the Ohio River to a point opposite East Liverpool. O. W. F. Patterson is the contractor for the grading.

Portland & Rochester.—This company will extend its second track from Westbrook to Portland, Me. The rails for the new track have already been received.

Providence & Springfield.—The local papers assert that the New York & New England will at once extend its Providence & Springfield line from Pascoag, R. I., to East Thomson, Conn., 7½ miles, opening a new route between Worcester and Providence. The recent issue of \$700,000 bonds guaranteed by the New York & New England road will provide the funds for the work. One of the officers of the branch road recently wrote that although the surveys had been made, it was very uncertain that the new line would be built this year.

Quaker City Elevated.—August 20 is the last day of the time allowed the projectors of the elevated road to begin work on their line along Market Street, Philadelphia. By the terms of the ordinance of Councils granting the company the privilege of building an elevated road on Market Street, it is to forfeit the privilege if work is not begun before Aug. 20. It is understood that the officials of the company have been making arrangements to put a gang of men at work on the construction of the road, near Darby, but nothing will be done on the actual construction of the road.

Quebec Central.—It is now alleged as a certainty that the long talked of extension from the township of Tring southeast to the Maine state line is to be built, and will form a connection with the Central Pacific at Lake Megantic, Que. The contract of building the road has been awarded to Mr. Meadow, and the work will be commenced as soon as practicable.

Quebec & Lake St. John.—H. J. Heemer, contractor for the Chicoutimi branch, is prosecuting work in earnest, and the road is expected to be completed by January. A large number of men is engaged on the work and the necessary machinery to facilitate the work has been shipped to the Chicoutimi end.

Salt Lake & Los Angeles.—It was expected to have the tracklaying completed to Saltair Beach this week.

The present terminus is on Great Salt Lake, about 133½ miles west of Salt Lake City. The track has been laid on the western end of the line very slowly, on account of a delay in receiving cross-ties. The rails are 60 lbs. to the yard, and as the road has been substantially and carefully built it will soon be ready for traffic.

Sandusky & Columbus Short Line.—Very rapid progress is being made on the grading. About 15 miles has been graded south from Bucyrus, O., and about the same distance north from Marion. Tracklaying is in progress from both ends, and it is expected to have the road completed between Marion and Bucyrus by Sept. 1. Tracklaying will begin south from Marion next week. It will be six or seven weeks, however, before any rails are laid from Columbus. The heaviest work is north of Bucyrus, where there are a number of deep cuts, and that part of the road between Bucyrus and Bellevue, a town just south of Sandusky, will be the last completed.

Scottsboro & Guntersville.—The right of way has been cleared for a number of miles beyond Scottsboro, Ala., and the force at work on the grading near that town now numbers about 300 teams. The present contract is for the line between Scottsboro and Guntersville but the survey has only been completed as far as Wood's Cove.

South Bound.—The fact that a survey was being made between Savannah and Jacksonville, Fla., to connect this road with the Florida Central & Peninsular has already been noted. The understanding is that the new line will extend from Hart's Road, Fla., north of Jacksonville to some point upon the South Bound near Savannah. The surveys will be made as rapidly as possible in order that the work may begin this summer. The road will run east of the Savannah, Florida & Western, and will, it is estimated, shorten the distance between Savannah and Jacksonville about 40 miles. The present distance by rail is 172 miles.

Terminal City.—H. F. Donkin and C. M. O'Dell, with a party of engineers, are at present engaged in completing the survey for the proposed extension from Mulgrave to the Terminal City, N. S.

Trenton Cut-Off.—A second track is to be laid from the west end of the present double track (about two miles west of the connection with the New York division at Morrisville) to Langhorne, Pa., a distance of about seven miles. Also from Bridgeport, opposite Norristown, to Tun Road, near Glen Loch, a distance of about 13 miles, making a total distance of about 20 miles to be double-tracked this year. When this road was completed in 1891 over 30 per cent. of sidings were built; additions have been made to this from time to time, and with the 20 miles now to be constructed the road will be double-tracked for the entire distance from Morrisville to Glen Loch, 46.1 miles. The exceedingly heavy traffic passing over this road (principally coal freight) makes this addition imperative necessary. During the month of June the number of cars hauled eastbound over this line was 13,500, and westbound 14,000. When the road was opened for traffic last year one passenger train a day was run in each direction between Trenton and Norristown, but this has been discontinued, and the road is now used almost exclusively for through freight traffic.

Tuscarora Valley.—The construction work is now in progress on this road through Juniata County, Pa., and it is expected to have 15 miles of the road in operation by October. The line is being built from Milford to Lock, Juniata County. J. C. Moorhead, of Port Royal, Pa., is Secretary.

Victoria & Sydney.—The engineer's party, in charge of E. J. Tilton, has left Victoria, B. C., going direct to Sydney, and will commence the survey from that end of the line. Within three weeks it is expected that this work will be completed, and contracts will then be invited for the first 10 miles of the road. The town of Victoria has guaranteed to the company three per cent. interest on \$300,000 of bonds.

Washington & Chesapeake Beach.—The contract for building the road from Washington to Chesapeake Beach has been given out to Neale & Co., of Pittsburgh, and the work will begin shortly. The line is about 30 miles long, extending from a point on the Baltimore & Potomac, near Washington, southeast to Chesapeake Beach. T. W. Tyrer, of Washington, D. C., is Secretary and Manager.

West Jersey.—A report that considerable new second track work would be completed on this line this year has been freely circulated lately, but we have the authority of one of the officers for stating that nothing will be done in this direction this year on either of the Pennsylvania lines to Atlantic City and Cape May, N. J. The Camden & Atlantic is now double track from Camden to Haddonfield, a distance of seven miles, and the West Jersey is double track from Camden to Newfield, a distance of 30 miles. This second track has been laid for several years, and nothing will be done this year toward extending it.

Yakima & Pacific Coast.—Griggs & Huestis, of Tacoma, the contractors for this branch of the Northern Pacific, have increased the force working on the road, and expect to complete the entire line by early fall. The track has been built to the western side of the summit of the mountain in Pacific County, Wash., 30 miles of track having been laid and the road ballasted for the same distance. The contractors state that, before the grading can be completed, 250,000 or 300,000 cu. yds. of earth has to be removed. The grade from the end of the track to South Bend, on the coast, 28 miles, will be ready for the rails in two months.

GENERAL RAILROAD NEWS.

Adirondack & St. Lawrence.—The reported negotiations between the New York Central and Dr. W. Seward Webb for the purchase of this road, have elicited the following statement from H. W. Webb, Third Vice-President of the New York Central: "Negotiations have been going on for some time and the road will undoubtedly come under the control of the Central. The road is yet uncompleted and it will take some time to finish it, and the actual transfer of the road will not take place for some time yet. Besides, no business will be done until after the return of President Depew, who will have to sign the necessary papers." The New York Central will thus control a direct line through the Adirondacks and to Montreal as far as Malone, N. Y., whence the Central Vermont owns the 40 miles to Coteau Junction. From that point the run to Montreal is made over the Grand Trunk.

Atchison, Topeka & Santa Fe.—It is officially announced that \$38,861,800 of the income bonds of the rail-

road have assented to the plan of conversion recently proposed by the company. Of this amount \$37,500,000 is held in Europe and \$31,331,800 in this country.

Des Moines & Kansas City.—A mortgage for \$2,000,000, given by this company to the Massachusetts Safety Deposit Co., has been filed for record at Des Moines, Ia. The mortgage is to secure bonds issued for improvements on the line, which is a narrow-gauge road running from Des Moines to Canesville.

Grafton & Belington.—The road heretofore known as the Grafton & Greenbrier, extending from Grafton to Belington, W. Va., having been changed to standard gauge, will hereafter be known as the Grafton & Belington road, and will be operated by the Baltimore & Ohio as the Grafton & Belington Division as part of the Parkersburg & Wheeling Division. The line is 42 miles long, and agents have been appointed at four of the stations—Grafton, Moatesville, Philippi and Belington.

Great Northern.—The opening of this road to Spokane, Wash., which is announced for Aug. 14, has been heretofore published in these columns. Concerning the probable arrangement between the Union Pacific and the Great Northern, by which the latter will make connection with the Pacific coast over the lines of the Oregon Railway & Navigation Co. between Spokane Falls and Portland, a well-posted man says: "The former management of the Union Pacific entered into a contract with the Great Northern, giving that company the right to interchange traffic for Portland at Spokane, upon a division of rates which accords to the Union Pacific a little more than a pro rata share of the receipts. It is understood that the present management objects to carrying out this arrangement, because the O. R. & N. lease has been found very burdensome, the annual deficit being from \$750,000 to \$1,000,000. If any revision of the contract is made it will probably be based upon some plan by which this burden will be divided—the Great Northern contributing a share of the rental charge."

Jacksonville, Tampa & Key West.—Judge Swayne, in the United States Circuit Court at Jacksonville, Fla., on Aug. 3, made an order setting aside Judge Pardee's recent appointment of General Manager R. B. Cable, as Receiver of the property. This is a victory for the minority stockholders, who oppose the management of President Coleman, and are represented by the American Construction Co., which instituted the proceedings for a receivership on July 6, to secure an adjustment of accounts between the railroad and the company. The railroad company opposed this application, but on July 21, its attorneys appeared before Judge Pardee and asked for the appointment of Mr. Cable as Receiver. Judge Swayne has since appointed Mason G. Young, Vice-President of the railroad, and also President of the American Construction Co., Receiver of the road.

Minneapolis & St. Louis.—The report filed with the Clerk of the District Court, at Minneapolis, by W. H. Truesdale, for the year ending June 30, 1892, shows that the balance on hand July 1, 1891 was \$491,310. The increase during the year was \$521,191, leaving the balance on hand, June 30, 1892, \$1,012,501. All the expenses have been paid, leaving the above amount as the net cash balance.

Montreal & Sorel.—A. A. Tailon, sequester, is making arrangements to have the road repaired and opened between Longueuil and St. Lambert, Que. This has been decided on as a result of an inspection recently made by Shanly & McCarthy, the company's engineers, 157 St. James street, Montreal, Que.

Orange Belt.—Foreclosure proceedings have been instituted against the road in order to effect a reorganization of its affairs. The proceedings are friendly, and there will be no receiver appointed.

Richmond & West Point Terminal.—At a meeting of the Advisory General Committee of the security holders this week Chairman W. E. Strong reported that he had appointed W. L. Bull, W. H. Goadby and H. J. Morse a committee of the six per cent. bondholders, and George Coppel, T. L. Manson and H. B. Plant a committee of the five per cent. bondholders. Mr. Strong said that Judge Bond had on Saturday last granted an order on the petition of W. P. Clyde and others, authorizing and approving the negotiations which had been made for the extension of the Richmond & Danville floating debt for two years, and authorizing the payment of the commission and the semi-annual interest on the loans, and that the holders of the loans had now practically all executed contracts for their extension. A resolution was adopted requesting the Directors of the Terminal Company to call a general meeting of stockholders at Richmond, Va.

St. Louis, Chicago & St. Paul.—The company has filed a mortgage in Illinois executed to the Atlantic Trust Co. to secure bonds for \$1,250,000 to be used for the extension of the road to East St. Louis and to Springfield.

San Francisco & North Pacific.—The gross earnings of the road for the year ending June 30 were \$880,471; the operating expenses, \$548,815; expenses for improvements, \$48,789; payments, \$256,649. This leaves a surplus revenue of \$81,007, or against \$56,551 for the preceding year. The company, therefore, earned a dividend of about 1½ per cent., but the surplus was expended for construction purposes.

Southeastern (Can.).—The Canadian Pacific intends to cease operating this line between Sorel and St. Guillaume, Que., in the fall, on account of the refusal of the municipality of Yamaska to furnish \$38,000 for the construction of a bridge over the Yamaska River.

South Bound.—The Florida Central & Peninsular, which has leased this road, has guaranteed five per cent. interest on the bonds, amounting to \$2,130,000, or \$15,000 per mile on 142 miles of road. The Mercantile Trust & Deposit Co., of Baltimore, is trustee of the bonds. In case the net earnings exceed the annual rental, the stockholders are to receive one-half the excess and the lessees one-half. The conditions of the lease require the building of a connecting line from Savannah to Jacksonville. By its terms the Florida Central & Peninsular does not take possession of the South Bound until it has completed this connecting link, which it guarantees to do by September, 1893. At the same time it guarantees the interest upon the bonds of the South Bound from the time of entering into the contract.

Wilmington & Northern.—A mortgage of \$1,000,000 was filed at Wilmington, Del., Aug. 2, to secure an issue of five per cent. bonds, redeemable in 40 years. The loan is to be used in extinguishing outstanding indebtedness and improving the road and building new branches. The stockholders authorized the new bonds at a meeting on July 21.

TRAFFIC.

Traffic Notes.

The steamer "Maryland" recently took 3,088 net tons of ore from Escanaba, Mich., to South Chicago, the vessel drawing 17 ft. 4 in. of water. The "Maritana," now being fitted out at Chicago, has a broader beam than the "Maryland," and is expected to carry 4,500 tons on the same draught.

The four railroads leading to the City of Mexico have agreed upon a traffic pool which will go into effect Sept. 1. The agreement was reached at London last week, but no details are reported. Freight rates have been greatly reduced by sharp competition, especially on freight from Europe.

A dispatch from Ottawa, Aug. 6, reported that the Dominion Cabinet had voted to abolish the rebate on tolls on eastbound cargoes through Canadian canals, by which vessels going to Montreal are enabled to carry export grain at 18 cents a ton less than vessels going to Odgersburg or other American ports. There is as yet, however, no official confirmation of this report.

All the mines under the control of the Wisconsin Central Railroad, on the Gogebic range, except the Ashland mine, have been closed, and about 2,000 men thrown out of employment. The cause of the shutdown is indirectly attributed to the Homestead strike. No ore from any mine under the control of the Wisconsin Central Company will be shipped, except from the Ashland mine, until the Homestead matter is settled.

The Transcontinental Association is to hold a general meeting in New York, Aug. 24. The Southern Pacific desires to reduce rates eastbound on canned goods and other important commodities, the vessels around Cape Horn having lately taken large quantities at very low rates. The Southern Pacific also complains of sharp competition on westbound freight and asks to have the first-class freight rate from New York to San Francisco reduced from \$4.20 to \$2.75 and the rates on numerous important commodities in still greater proportion.

Chicago Traffic Matters.

CHICAGO, Aug. 10.

The boys' play connected with the Atchison controversy with the chairman of the Western Passenger Association about the low rate to Denver, as outlined in my last week's letter, is still kept up. The matter now hangs upon the decision of the arbitrators upon the question whether the chairman was within the rules in naming A. J. Smith as arbitrator in the appeal. After this is decided another board will decide whether Mr. Ford is eligible, and then the original appeal will be taken up.

Passenger rates in Central Traffic territory are getting sadly demoralized. Round trip rates between Chicago and Niagara Falls are down to \$9.50, including sleeping car, by the Erie. This is to meet a rate of \$8 made by the Nickel Plate, against which the fight seems to be made. The Big Four has put in force a \$5 rate from Cincinnati to Chautauque, and \$4 from Toledo, Detroit and Cleveland, and these rates have been met by the Erie. In the southeast affairs are in a demoralized state, owing to cuts on the Washington excursion rates.

The report that the commissioners of the Western Traffic Association would consider the refusal of the Missouri Pacific to divert freight under their order, at their session on the 10th, is erroneous. The Missouri Pacific having taken an appeal to the Advisory Board in the matter, the Commissioners will make their report accordingly. The Missouri Pacific, it should be said, has not refused to divert the freight. It simply asks a suspension of the order, pending the construction by the Advisory Board of a resolution passed at the May meeting.

The Western Freight Association is in session this week. The most important matter under consideration is an application by the Burlington for a change in the agreement, which will require at least 10 days' written notice prior to each monthly meeting, of a proposed reduction in rates or change in any rule or regulation, instead of five days, as now provided; providing that a two-thirds vote of all lines present shall be required for the adoption of any proposition involving rates; amending the rule requiring written notice of intention to make a rate in opposition to vote of the association so as to require 30 days' notice from the date of the meeting before the rate can be made effective, instead of 10 days, as now, and requiring a two-thirds vote to put in effect corresponding reductions upon other traffic. After a long discussion the application was referred to a committee.

There is little probability that the St. Paul will apply to the Interstate Commerce Commission for a rehearing on the lumber case. It has complied with the rule, and if the other roads want to have a rehearing they can apply for it. Chairman Midgley is endeavoring to bring about a rehearing, fearing that unless something is done a general demoralization of the lumber rates will speedily ensue and he may not be able to hold his lines together.

The Vandalia has agreed to restore rates eastbound from St. Louis on grain and sixth class to the standard basis of 2½ cents on grain, and 25 cents on other sixth class goods, Chicago to New York.

Eastbound Shipments.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Aug. 6 amounted to 52,745 tons, against 53,872 tons during the preceding week, a decrease of 1,127 tons. The proportions carried by each road were:

Roads.	W'k to Aug. 6. W'k to July 30.			
	Tons.	P. c.	Tons.	P. c.
Michigan Central.....	7,350	14.0	7,085	14.3
Wabash.....	2,926	5.6	2,840	5.3
Lake Shore & Michigan South.	7,209	1.8	5,828	10.8
Pitts., Ft. Wayne & Chicago..	4,943	9.5	5,241	9.8
Pitts., Cin., Chicago & St. Louis	6,384	12.1	5,576	12.8
Baltimore & Ohio.....	2,081	3.1	2,518	5.3
Chicago & Grand Trunk.....	4,379	8.3	4,036	8.6
New York, Chic. & St. Louis..	3,596	7.6	3,245	6.7
Chicago & Erie.....	6,881	13.0	7,017	13.0
C., C., C. & St. Louis.....	6,337	12.0	5,606	10.5
Total.....	52,745	100.0	53,872	100.0

Lake shipments for the week ending Aug. 6 were 89,183 tons, against 91,407 tons for the preceding week a decrease of 2,224 tons.

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The WESTINGHOUSE AUTOMATIC BRAKE is now in use on 24,000 engines and 325,000 cars. This includes (with plain brakes) 232,000 freight cars, which is about 23 PER CENT. of the Entire Freight Car Equipment of this country, and about 80 per cent. of these are engaged in interstate traffic, affording the opportunity of controlling the speed of trains by their use on railways over which they may pass. Orders have been received for 173,000 of the Improved Quick-Action Brakes since December, 1887.

The best results are obtained in freight train braking from having all the cars in a train fitted with power brakes, but several years' experience has proven conclusively that brakes can be successfully and profitably used on freight trains where but a portion of the cars are so equipped. Below is a graphical illustration of the progress made in the application of the Automatic Brake to freight cars since its inception:



193,168 freight cars fitted with the Westinghouse Automatic Brake, which is nearly 20 per cent. of the Entire Freight Car Equipment of this country.

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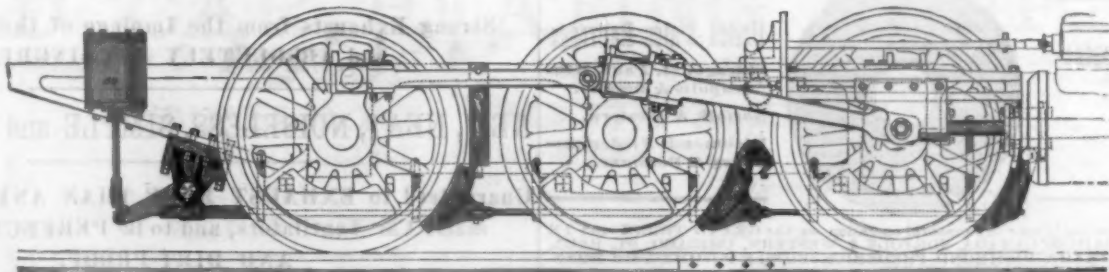
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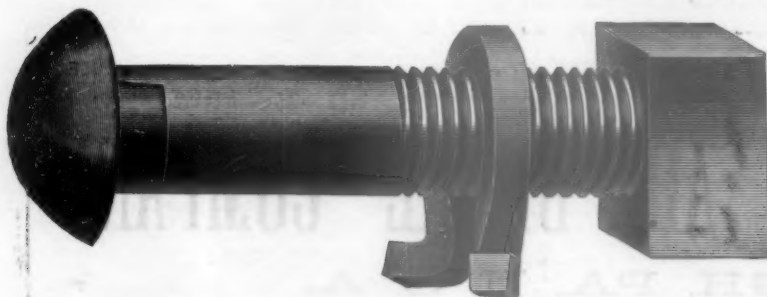
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Standard Outside Equalized Pressure Brake, for two or more pairs of Drivers furnished to operate with either STEAM AIR or VACUUM.

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 SAMPLES FREE.

This nut lock is presented on its merits as the best and cheapest device for securing track joints.
 It is a torsional loop made of good quality of tempered spring steel, having horizontally inclined foot pieces, which are curved inward, thereby greatly increasing the spring resistance and acting simultaneously: rests upon the base of angle bar, or underlying rail base in case of fish plate, preventing the loop portion from rotating and hammering down thread of bolt.

The nut lock for $\frac{1}{4}$ bolt made of $\frac{1}{4}$ in. square steel, standard pattern, yields a tension of 4,300 lbs. on the bolt, which is sufficient to reduce the wear of the bearing surfaces of the angle bars on the rails, imparting, as it does, a uniform bearing the entire length of the bar.

The "Standard" Nut Lock has sufficient elasticity to maintain a tight joint, which cannot be truthfully said of many light-weight single coil washers.

The "Standard" Nut Lock is, in its superficial form, similar to an annular coil twisted out of plain, i. e., the curved shoulders or ends of the loop proper, are spread in the usual manner of spring coils, at which bearing points the locking friction is equal to that of the best single coil washer, and added to this it is terminated in inwardly curved extensions, which must apparently furnish additional short leverage spring force of a torsional character.

Distinctive Merits of the "Standard" Nut Lock, Condensed:

Fixedness of position—cannot rotate and hammer down threads of bolt.
 Cannot get one end into elongated slot of angle-bar.
 Unlike any permanently placed, double washer, the Standard is interchangeable regardless of distance between bolts.

Cannot be put on wrong side out, as the outward projection of the foot pieces would prevent the nut being turned up.

Has more spring power directly under the nut than any two ordinary coil nut locks.

Being fixed in position, it offers double the locking friction of nut locks, which when in their dead "set" condition turn back with nut by the vibrative effect of passing train.

The "Standard" Nut Lock embodies the old principle of spring power improved by overcoming the objection to the double washer or nut lock, and covering the weak points of the single coil washer.

THE STANDARD COMBINATION TIE PLATE AND BRACE

POSSESSES THE FOLLOWING MERITS:

1. It prevents absolutely the canting of the rail into the tie, thereby greatly increasing the life of the tie.
 2. It prevents the rails from spreading or canting over and wearing one side only.
 3. The combination of the brace and plate obviates the necessity of spiking the rail and brace separately, thereby saving two spikes and securing the service of the inside spike for holding the rail; it also prevents the rail from working up and down, and laterally, thus making it impossible to wear the neck of the spike.
 4. The plate and brace being made of malleable iron, is practically indestructible.
- The tie plate and brace is especially useful for curves and guard rails, and also on bridges, whether the rail is laid on ties or on stringers. A tie plate without a brace will not save the head of the spike. A brace without a tie plate will not save the tie, and in a short time the rail will wear into the tie.

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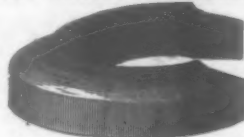
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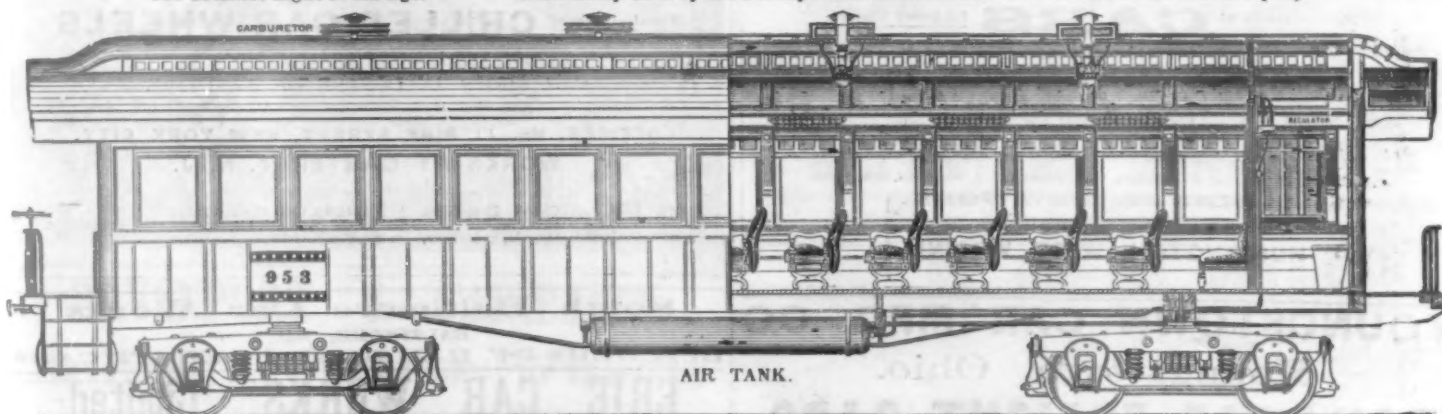
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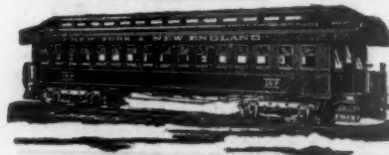
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Shoes should be ordered in accordance with the above allotment of territory.

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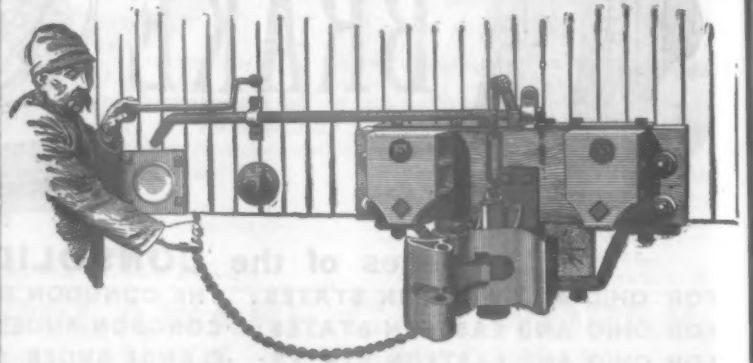
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With Chain Attachment for Opening the Knuckle WHEN REQUIRED.

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VERTICAL PIN LOCK.

With Five Square Inches Bearing Surface.

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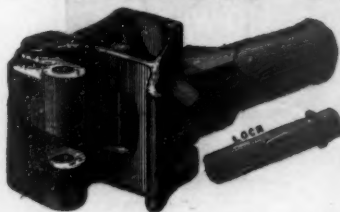
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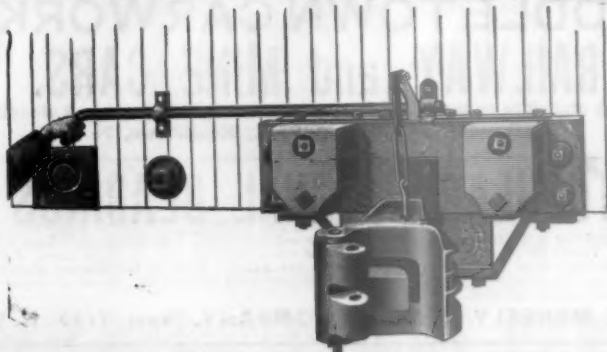
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M. C. B. TYPE.

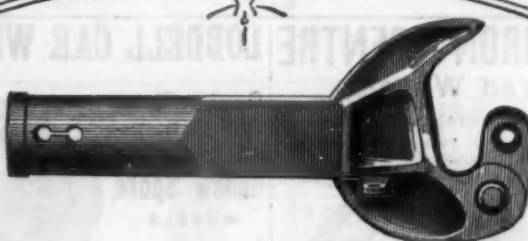
THE STRONGEST AND THE ONLY SAFETY COUPLER.



The knuckle may be thrown open for coupling by the hand-rod at the side of the car, rendering it unnecessary for trainmen to go between the cars to open the knuckle. The action is positive, and not dependent on springs or gravity.
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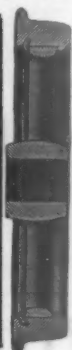
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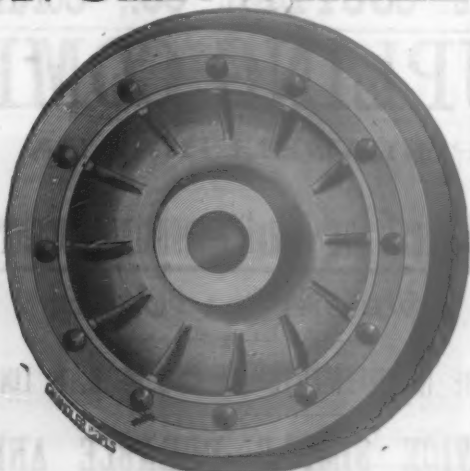
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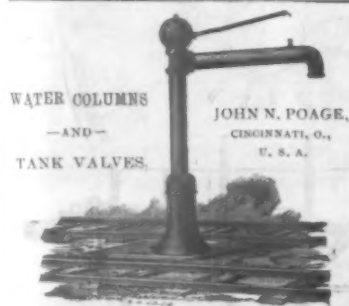
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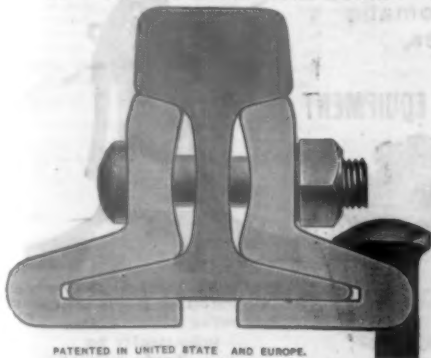
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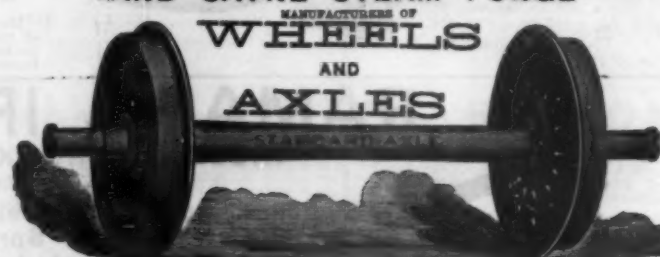


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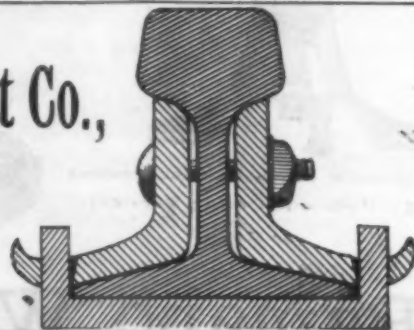
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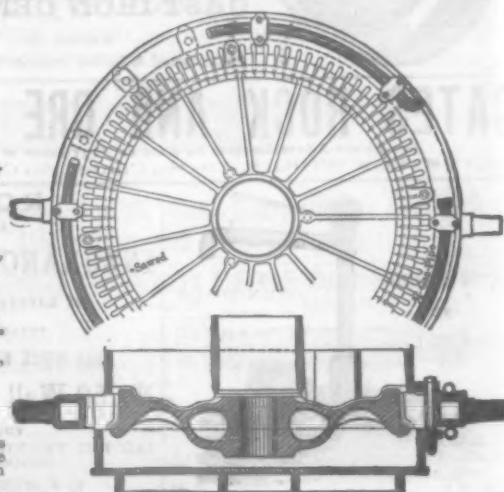
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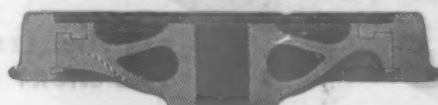
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A. M. Sunday, arriving at Lake Villa 10:30 A.
M., Antioch 10:40 A. M., Mukwonago 11:40 A. M.,
and Waukegan 11:50 A. M. Returning leave
Waukegan 4:45 P. M., Mukwonago 5:55 P. M.,
Antioch 6:15 P. M., Lake Villa 6:30 P. M., arriv-
ing at Chicago 8:45 P. M. For the accommoda-
tion of excursionists desiring to remain in the
country over Sunday "The Business Man's
Special" will again be placed in service. This
train will leave Waukegan at 5:30 A. M., arriv-
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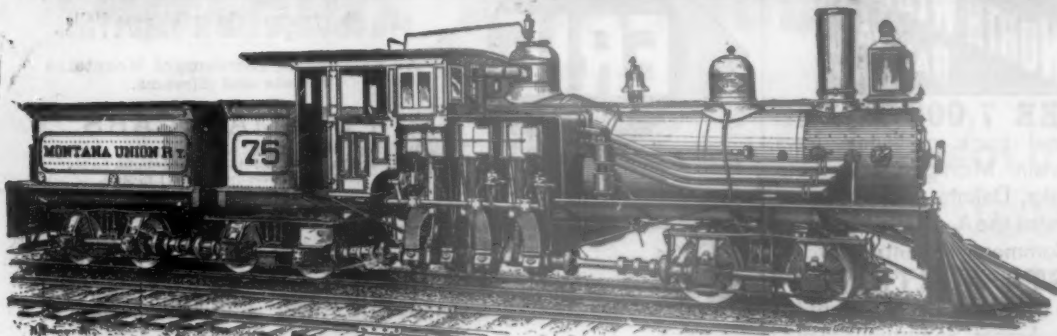
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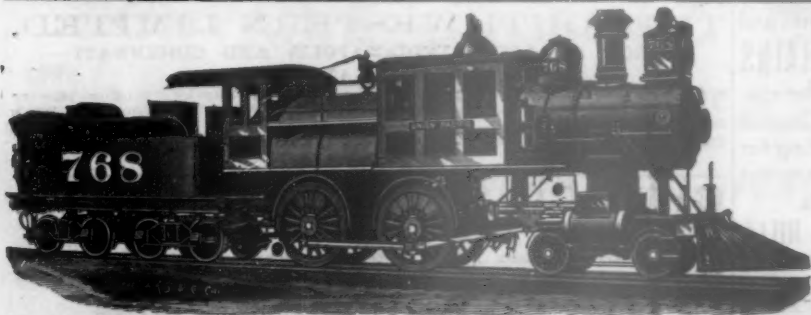
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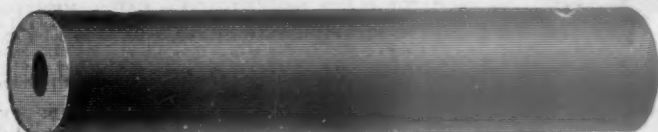
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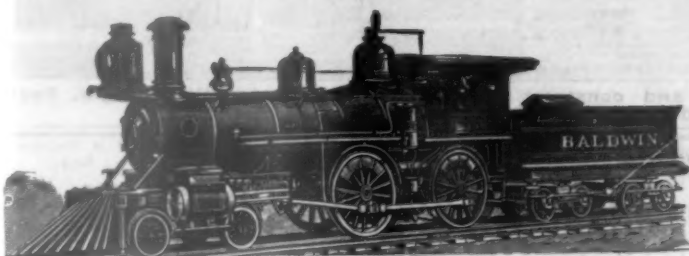
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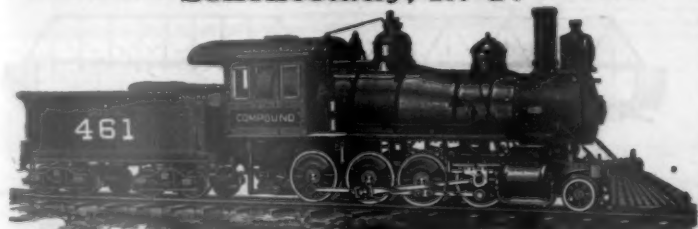
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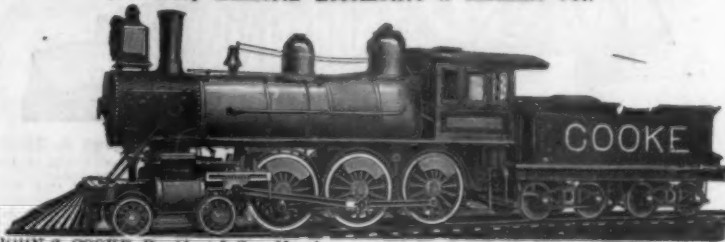
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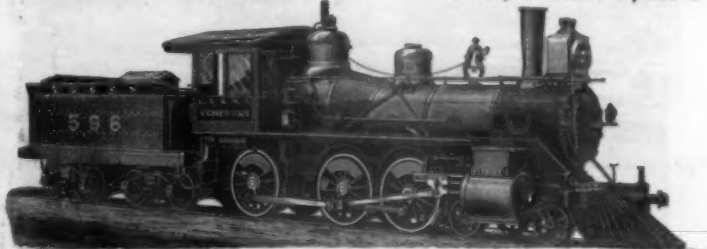
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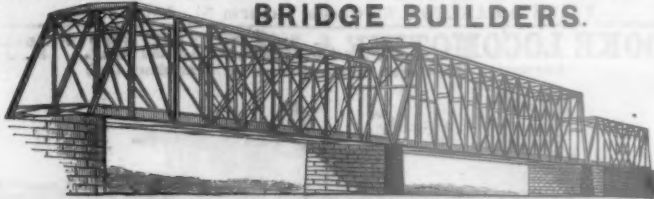
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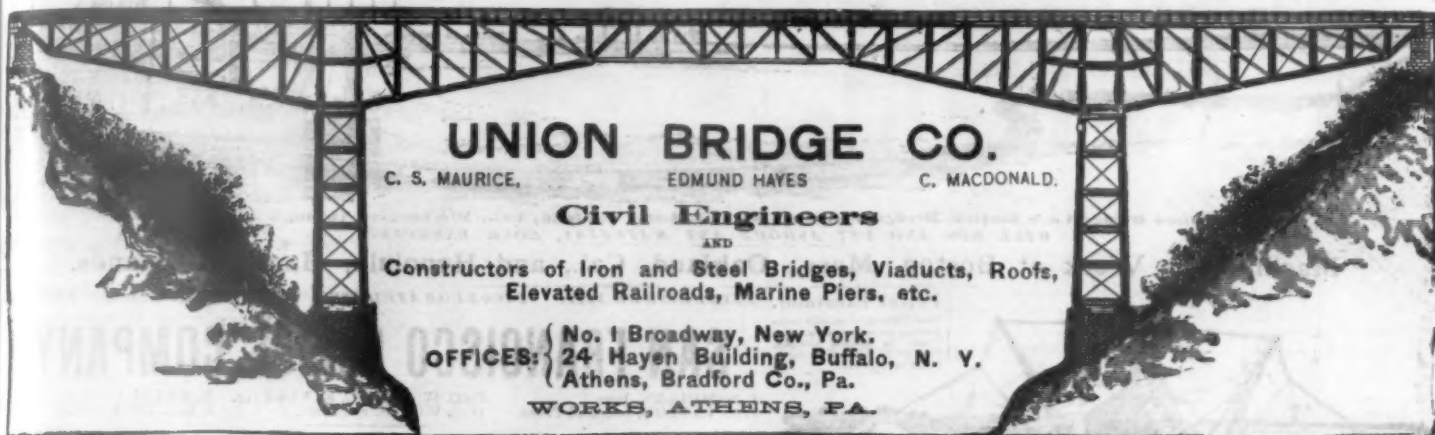
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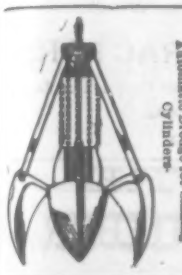
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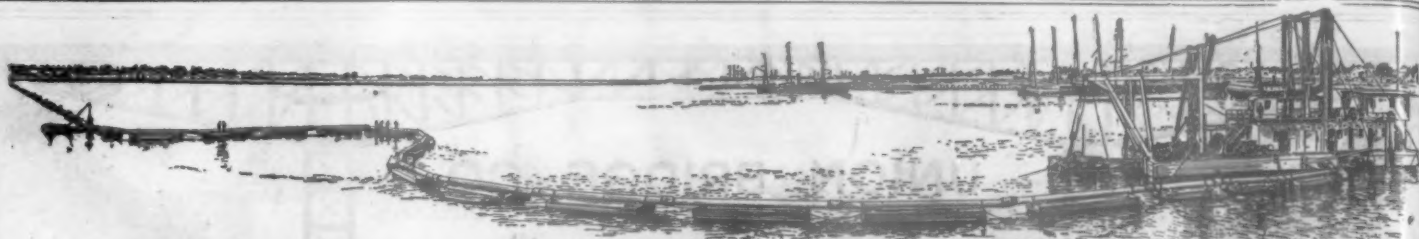


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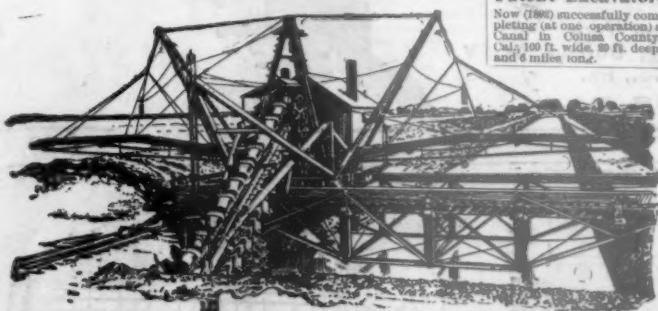
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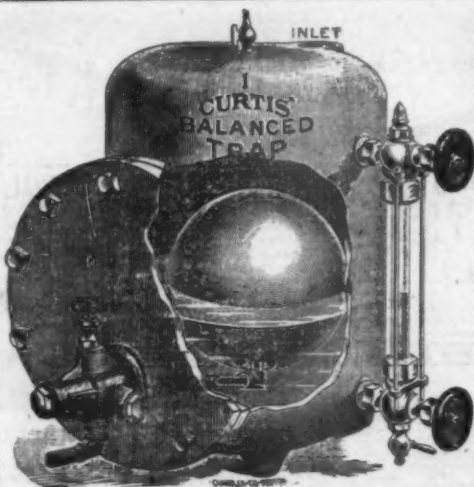
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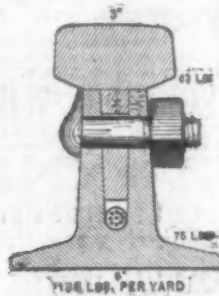
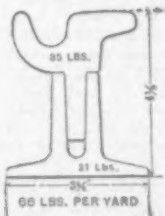
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during which time the track has been partially tamped up but once—in January, 1891. During eight months not a moment's work was done on track,
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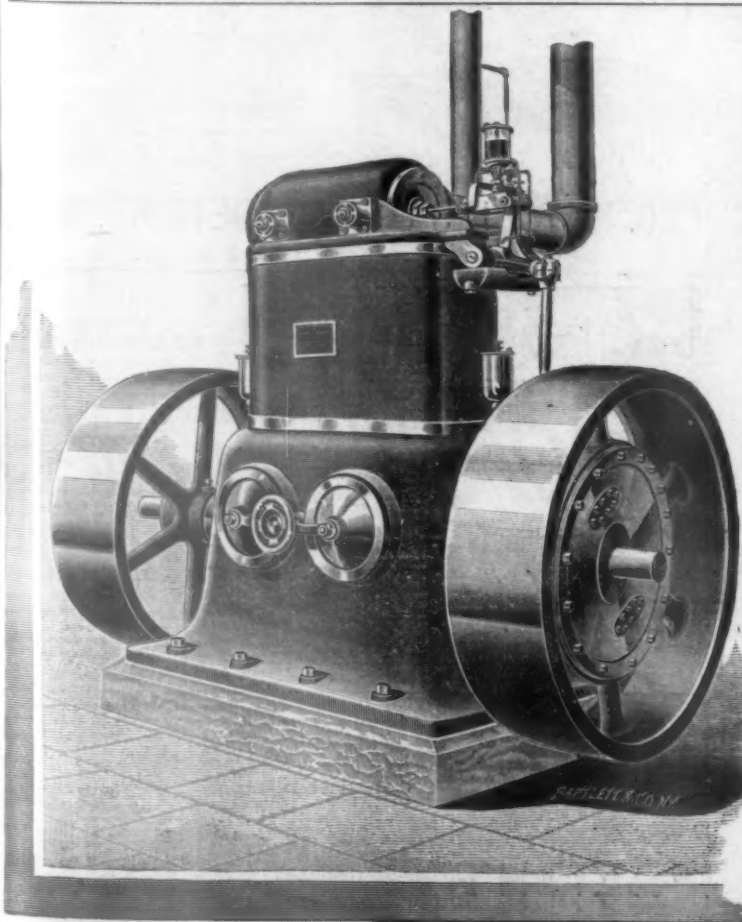
1. The cost of the rail is but a small fraction more than the T rail.
2. That there is no friction between the upper and lower parts, the contact surface
after nine months' service presenting precisely the same appearance as when
laid, showing not the slightest evidence of attrition.
3. That cost of renewal of this track is but one-half, as the lower part becomes a
permanent part of roadbed.
4. That the cost of its maintenance is not to exceed one-tenth.
5. That there can be no sunken joints.

6. That there are no broom-ended rails.
7. That there can be no tipping of frogs.
8. That by reason of these facts the friction to rolling stock and danger of travel is
reduced to a minimum.
9. That the life of the ties is greatly lengthened, as the spikes are not driven and
redriven, splitting them and filling them with holes which become filled with
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A PLAIN STATEMENT OF FACT.

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sessing an economy superior to the Simple Engine, has been decisively
proven, "much to the disgust of the stockholder," to show normal
economy only at or about its rated power, and to fall off in economy
faster than a Simple Engine as the load falls off; moreover, very much
faster under the extreme light loads that are common at times in many
industries. This point is at last reluctantly admitted by the more
candid builders of such engines, most of whom now advise against
compounding for variable loads. The reason is in their inability to
divide the load and range of temperature proportionately and auto-
matically between the cylinders at all points of cut-off. Hence the
low-pressure cylinder expands its steam below atmosphere under a
moderately early cut-off, thus converting itself into an Air Pump, and
becoming a load upon the high-pressure cylinder instead of a co-
laborer with it. This point was distinctly foreseen by the designers
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was worked out, making expansion below atmosphere impossible under
any load, however light. For the first time in the history of
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irrespective of load, and hence for the first time the Compound
Non-condensing Engine has been made practicable. The results,
demonstrated by test, show that where an ordinary Compound will
range from 25 lbs. to 70 lbs. water per H. P. per hour from full to
quarter load, the Westinghouse Compound, between the same limits,
will range from 23 lbs. to 29 lbs. We have not deceived ourselves in
this matter, and propose that the facts shall be understood. To
those interested in the nicer points involved we will be pleased to send
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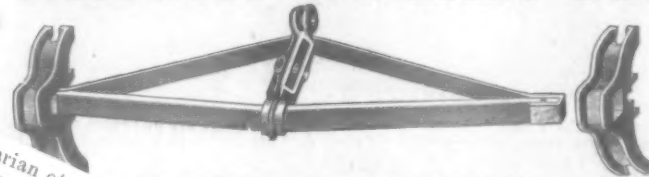
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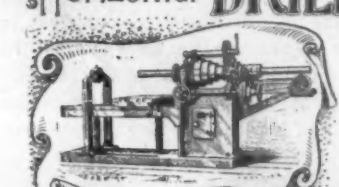
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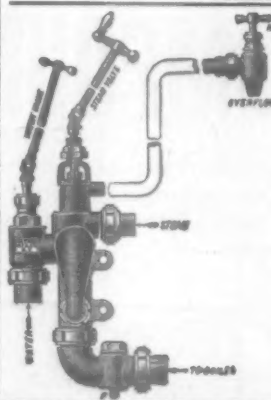
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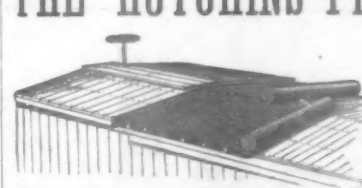
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